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ABSTRACT

The 23 papers presented in this Proceedings are grouped into four categories: business management; facilities planning, design, and construction; human resource management; and energy and environment. Papers are: (1) "A Business Approach to the Facility Function" (Alan B. Abramson); (2) "Management by Strategic Planning" (Jerry C. Black); (3) "Physical Plant: Competing in the 21st Century" (R. J. Carter); (4) "Rightsourcing Your Facility Services" (James B. Clayton); (5) "A Rental Model for University Space" (Robert Grant and Alan Neilson); (6) "Strategic Planning as a Tool for Improved Facilities Management" (Donald L. Mackel and Rodney Rose); (7) "Reengineering Caretaking at the University of Toronto" (Jim Stanley); (8) "Preserving 'In-House' Physical Plants" (James O. Roberts); (9) "Integrated Building Commissioning Case Study: University of Washington Chemistry Building" (Richard B. Casault); (10) "HVAC System Commissioning" (Rebecca Thatcher Ellis, James J. Sebesta); (11) "Grounds Improvements for a Safe Campus Environment" (Tom Leback and Jay Klingel); (12) "The Particle Method: A New Approach to Campus Planning" (Brian W. Miller); (13) "'Right-Sizing' in the 1990s--Shaping the Future with Master Planning" (John R. Reeve); (14) "Creating a Picture Perfect Campus: The Successful Campus--Look Good or Look Out!" (Mike Van Yahres and Syd Knight); (15) "Linking Supervision to Organizational Success" (Judith A. Cooper and Michelle Estep); (16) "Practical Employee Recognition Promotes Greater Productivity and Achievement" (Joseph E. Greenawalt); (17) "Creating a Cross-Functional Workforce" (Brian Yeoman and Denise S. Carpenter); (18) "In this Era of Shrinking Budgets, Is Organizational Redesign and Adopting a 'Quality Culture' Worth the Pain?" (Robert S. Hascall et al.); (19) "From Keeper to Partner: Creating a Future through Organization Culture Change" (Van King et al.); (20) "Refrigerant Management Using Ammonia" (Philip G. Rector and William Nelson); (21) "University of Toronto Waste Management System" (Gary P. Nower); (22) "The Social Engineering of Energy Conservation" (Paul D. Ruskin); and (23) "The Greening of Facilities" (Marion B. Smith). (DB)

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The Proceedings

1995 Educational Conference & 82nd Annual Meeting

July 16-18, 1995
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1995 Educational Conference & 82nd Annual Meeting

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Business Management

A Business Approach To The Facility Function

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Abstract

With the recent changes in the fields of education and facilities, a new context is needed to tie the facility function into the business and academic objectives of the institution. This paper demonstrates the link between resources, the facility function, facility objectives and the business objectives of the institution. A model of the facility function will be presented. This model seeks to provide an economically balanced look at systems, processes, human resources, and information/communication. What results is an analytical tool that helps bridge the gap between the objectives of facilities officers and the objectives of business officers. It also provides a context for business driven facility decisions. This analytical tool addresses the quality process, re-engineering, mission congruence, productivity, benchmarking and outsourcing. This approach is both elegant and simple, and has been tested in several commercial, health care, and governmental environments.

The Role Of Facilities

The role of facilities has changed significantly in the past several years. The "old way" or the traditional way of viewing facilities sees them as fixed costs. These fixed costs not only include real estate and construction costs, but also include the associated services that are required to maintain their operation.

The modern view of facilities is more strategic. Facilities are viewed as manageable assets. In this context, facilities contribute to the strategic mission of the institution, affecting profitability, while enhancing or detracting from occupant effectiveness. In summary, facilities must support the business or academic objective of the organization that resides therein.

The Opportunity

By viewing facilities as manageable assets, we now have a prime opportunity to reallocate applied resources which may reduce fixed costs, and may also provide an opportunity to increase the quality of service provided by the Facilities Group. In addition, where facilities and facility services are not meeting end user requirements, the source of this discontent can now be identified and appropriate resources assigned to correct the root cause of the problem.

It has also become a common practice in the economically lean 1990's to reduce "fixed" costs such as facility costs via budgetary edict. While waste may exist in any service organization, a good business model that can demonstrate the relationship between facility services and costs can be extremely helpful in precluding end user problems.

From an organizational viewpoint, there is a need and opportunity to facilitate better communication between those responsible for facilities and those responsible for financial planning and control. This communication can only enhance the teamwork of management permit the achievement of even greater efficiencies, while understanding the nature of facility support that is required.

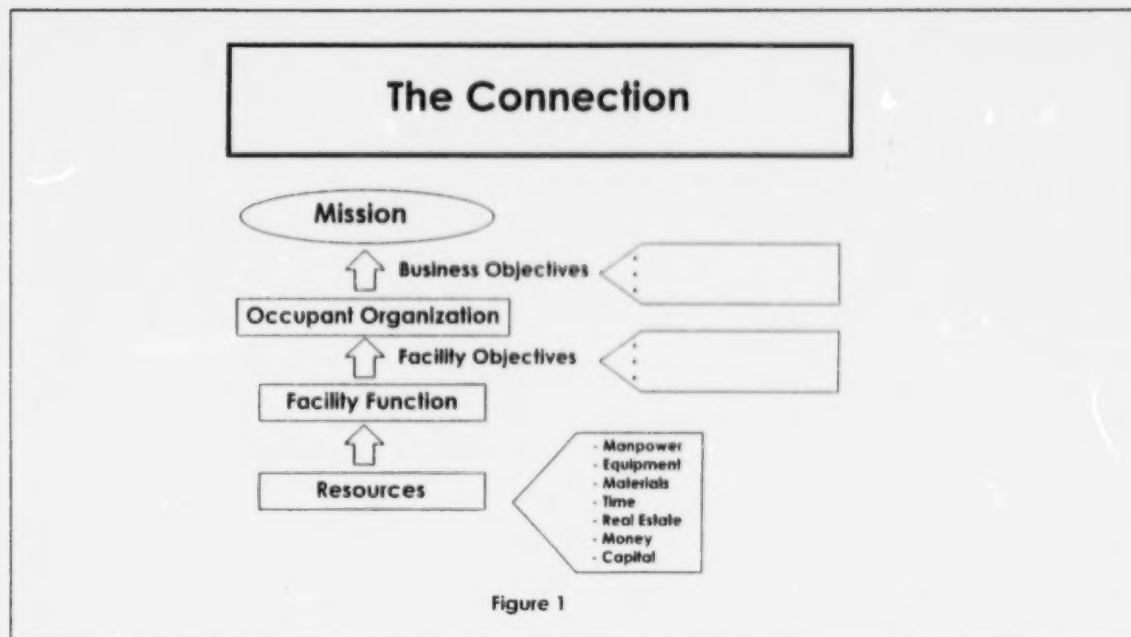
The Connection

The critical tool that enables a universal understanding of how to apply a business approach to the facility function is demonstrated in Figure 1. Figure one demonstrates the connection between the required resources and costs associated with the facility function, and the business or academic mission of those who occupy the facilities in your Institution.

Several important conclusions can be inferred. They are as follows:

1. The occupant organization has its own objectives, business or otherwise, that support or enhance the mission of the institution.
2. Facilities exist for the purpose of supporting the objectives of the occupant organizations that reside within them.
3. The objectives of the occupant organization will vary by organization and by facility. The facility objectives must vary accordingly. For example, within a college or university environment, occupant organizations may require spaces to support classroom, research, healthcare, computer center, residential or office functions. The facility objectives vary widely for these very different occupant uses.
4. Management of the facility function requires optimization of many and varied resources.
5. It is rare that facility objectives are defined, understood and well communicated among the occupants and the service providers for each facility on a campus.
6. It is equally unusual that the objectives of various occupants and their organizations are well developed, understood and communicated among the occupants and the service providers.
7. Therefore, the achievement of congruence of facility objectives with user objectives is rarely achieved. Without this congruence, how can the use of resources be optimized by those responsible for the facility function?

It may, therefore, be concluded that the asset approach to facilities and the optimization of resources to serve the facility function, cannot be properly implemented without a full under-



standing of end user objectives within every facility on your campus and the development of a well understood set of facility objectives.

Acceptance of this model is where business driven facility planning starts. This model simply, yet robustly, establishes "the connection".

The Facility Function Model

Now that we understand the connection between the facility function and the mission of the organization which occupies the facility, we need to have a model that allows optimization of the resources that the facility function requires. For this, we choose a simple structure, namely, a three legged stool. Conceptually, the stool must be strong enough to support the facility objectives. If any of the stool's structural components, i.e. the three legs or the seat, are too "weak", then the stool will break and the facility function will fail to support the facility objectives. This model is depicted in Figure 2.

The four components of the stool represent:

- Building Systems
- Processes
- People
- Information and Communication

Note that the "seat", representing information and communication, covers all three legs and represents the transfer of data among the systems, processes and people. As previously noted, all four structural elements must be strong enough to support the facility objectives. Conversely, if any of the structural components are stronger than necessary to support the facility objectives, then resources are being used or spent to unnecessarily strengthen that element. Therefore, in

Model of the Facility Function

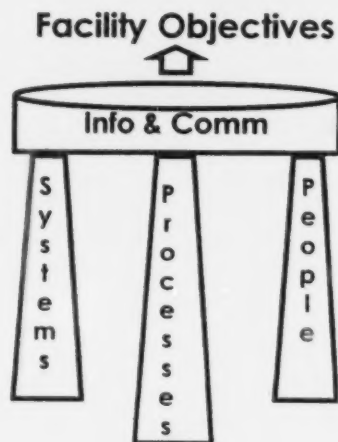


Figure 2

Systems

- HVAC
- Electrical
- Plumbing
- Fire Protection
- Voice, Data, Information
- Security
- Central Plant
- Elevators/Materials Handling
- Energy Management
- Lighting
- Control
- Waste Management
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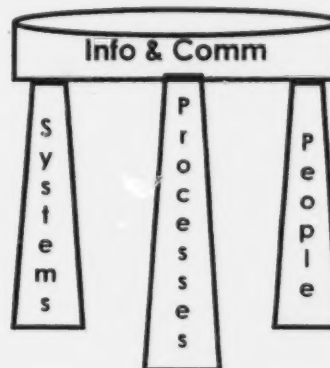


Figure 3

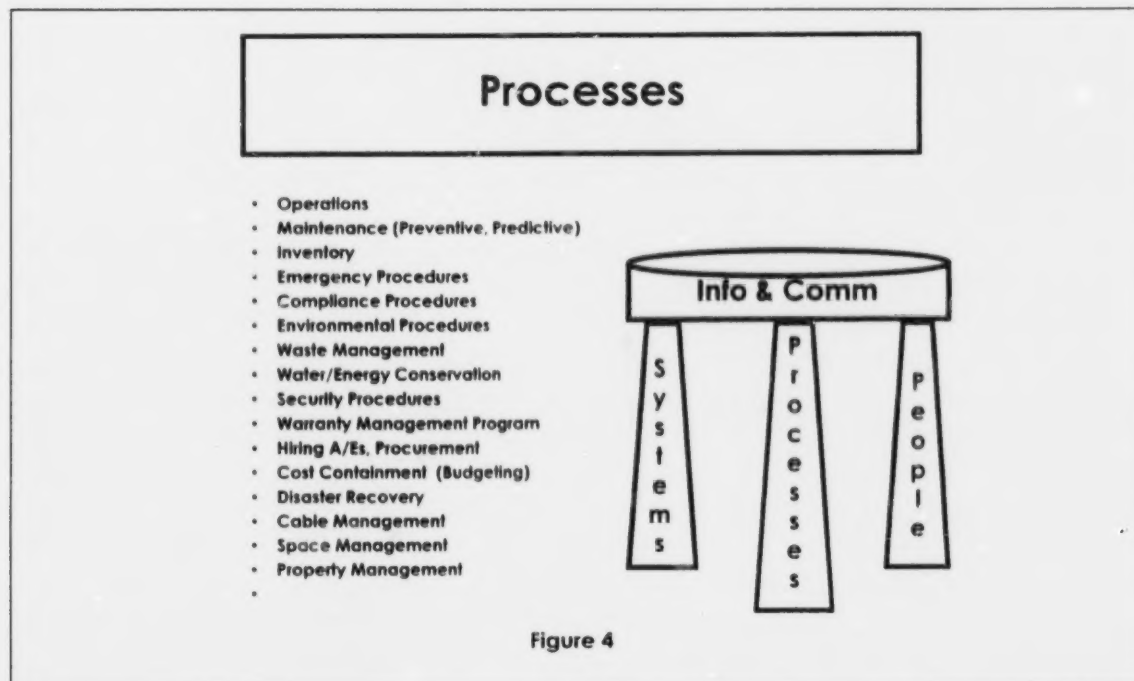
concept, we can use this model to determine how to best balance our investment in systems, processes, people, information and communication. We will describe later in this paper how to utilize this model in an audit process to optimize resource allocation.

To further describe the individual elements of this model, a partial list of examples for each component is presented in figures 3, 4, 5, and 6. The lists associated with figures 3 - 6, are partial and are intended to demonstrate by example, the definitions of each element of the facility function model.

It is now appropriate to summarize how the facility function model fits the Resource/Mission "Connection" model previously described. As we review Figure 1, the facility function supports the facility objectives, which must be defined in the context of the occupant organization and their respective business objectives. This must, of course, be done for each building or building type associated with your institution. When the facility objectives are well defined, we can utilize the facility function model to optimize resource allocations within the facility function.

The Analytical Process

We now have a basis to examine the opportunities associated with reallocating resources, reducing fixed costs and overhead, and providing a business driven improvement plan. In general, we look for the improvement opportunities by reviewing the "structural components" of the facility function, i.e. the three legs and the seat of the stool. We find the opportunities by comparing the structural components to industry benchmarks or to your own experience records. We start by identifying variances their associated root causes and the resulting potential improve-



People

- Deployment Philosophy
- Organization & Staffing
 - Types (Job Descriptions)
 - Quantity
 - Structure
 - Matched to Workload
- Accountability
- Performance Criteria
 - Technical
 - Personality
 - Quality
- Evaluation (baselines)
- Hiring Procedures

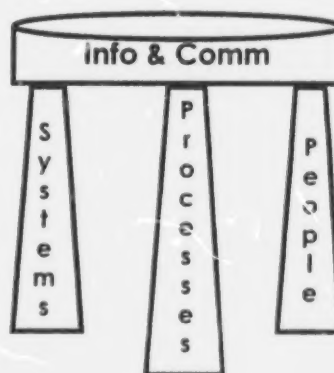


Figure 5

Information & Communication

- Documentation
- Benchmarking
- Training
- Information Management
- Cost Tracking
- Monitoring performance
- Customer Satisfaction
-

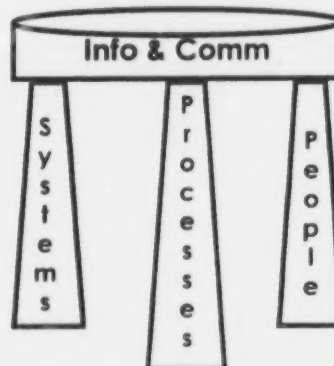
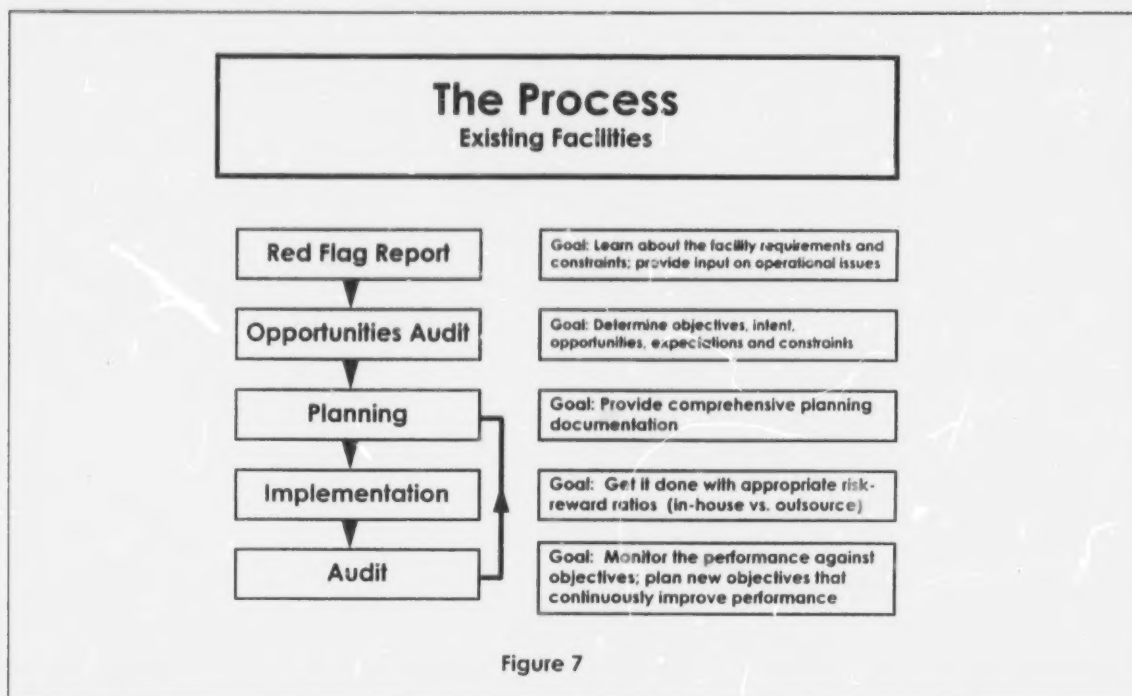


Figure 6

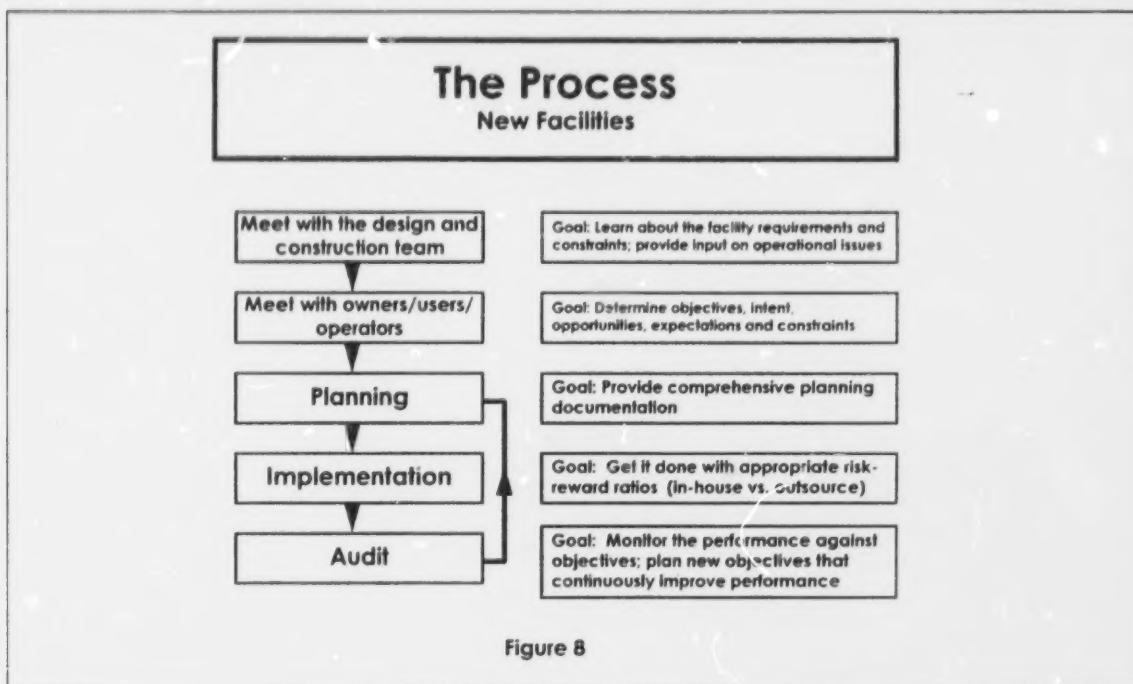


ments. A suggested process for continuous improvement in existing facilities using this model is presented in Figure 7.

Please note that the process presented in Figure 7 is heavily based in Quality principles. The primary quality principle associated with the Red Flag report is related to the "80/20 rule". This rule states that "80% of your benefit will come from 20% of your opportunities". Also note that in the planning phase we are proposing that process re-engineering or quality process implementation are important planning elements across the disciplines. It is also critical to note that the goal of implementation associated with the facilities function considers that in house solutions vs. outsourced solutions are equally good in achieving a result on a conceptual basis. This is important to note since planning of a solution is independent of whether one uses an outsource approach or an in house approach. The anticipated results should be equal for both. This process also requires that you continually seek to improve performance of your facility function by monitoring action plans against objectives through regular audits. The most important quality principle emphasized within this process is the requirement to know your end users and seek to satisfy, if not delight them.

New Facilities

While the previous discussion presents, the opportunities associated with existing facilities, new facilities are excellent candidates for the application of this model. The opportunity in new facilities is to optimize resources and minimize fixed costs and overhead while facilitating a smooth transition from construction move-in, in addition to providing great service and a productive environment for all who reside in the facility.



The process for new facilities is represented in Figure 8.

It is important that those who will be responsible for providing services to those who reside in the facility be involved early in the design and construction processes. This will likely result in a facility that costs significantly less over its life cycle and may very likely cost less to build.

Conclusion

This paper has presented a methodology by which you can evaluate your facility function in the context of the business priorities of your institution. A summary of the benefits are as follows:

- A Benchmark Comparison to other Universities may be obtained via the Red Flag Report.
- An independent view of your Facility Function will be developed.
- A Logical Set of improvement priorities will be created.
- A Business driven improvement plan will result.
- An optimized plan of resource utilization and resource requests for the short and long terms will serve as input to the business planning process of your institution.
- The credibility gap between the business managers and the facilities managers within your institution will be eliminated.

Management By Strategic Planning (MBSP)

Jerry C. Black

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Introduction

Planning in universities' facilities management organizations over the past decades can be said to be reactive rather than proactive as facilities organizations experience some revolutionary changes. These changes may have been as a result of regulatory issues, quality movement, re-engineering, student enrollment, ADA, EPA, or a host of other external forces dictating action.

The conditions that faced facilities management organizations in the 1970's and 1980's and now into the 1990's have not changed dramatically. Buildings are older, are not absolutely maintained, the cost of goods is up, labor cost are up, budget cuts are everywhere, deferred maintenance is rising at a rapid rate, and the overall cost of operations is significantly increased.¹

To meet these many challenges, a variety of planning practices surfaced during this turbulent period. Most notable were organizational master planning, contingency planning, and long range planning. Regrettably, none of the planning concepts focused on bringing management practices in line with planning practices.

In the 1990's the use of Total Quality Management concepts was introduced as a way to improve efficiency and in some cases to improve aspects of organizational behavior. These issues made it perfectly clear a need existed for a planning process that integrated managers' management concepts and strategic planning. In this author's approach, Management By Strategic Planning (MBSP) emerged as a viable alternative.

University communities in the 1990's are expected to experience a difficult period of operation for facilities management organizations. Some universities and colleges will close, operational funds will be less, support personnel will decrease, buildings will continue to age, and the ever increasing deferred maintenance will grow.¹ The laissez-faire styles of management will be left at the starting gate and will need to be replaced with MBSP. Through the use of MBSP facilities management organizations can overcome the adversities facing them today and in the future.

MBSP in its current mode can make facilities management organizations more competitive by identifying the right thing to work on, and at the same time focus the available resources. By focusing on the right thing, it also links plans functionally, and provides cross-functional integration of people from all levels of the organization into the planning cycle. MBSP can deliver a

consistent, repeatable process that adjusts for anticipated changes in service level, improvements, employee development, redevelopment concerns, and aligns with the need to achieve university objectives.

Traditionally, strategic planning processes are characterized by events like data gathering, annual work plans, and budget plans hinged together under a calendar driven activity. Today's fast paced environment allows units to respond quickly to changes as directed by unit leadership and integrates the changes into a continuous improvement process throughout the year. Using MBSP allows all activities to become part of the long-range planning direction, because MBSP is a continuous process instead of a strictly calendar driven process that allows for the alignment of strategic objectives, objectives, strategies, and projects into the daily operational activities of organizational behavior.²

MBSP Overview

MBSP starts with the development of a organizational **Mission, Vision, and Operating Principles/ Values** all of which are part of a clearly defined ten step process. The attached chart (Figure 1) is provided to clearly show the relationship between all MBSP steps.³ In particular, the frequency of making changes and coordination of budget planning into the overall process. MBSP is driven by the basic principle that planning is supported by a budget. So throughout MBSP "Budgeting to the Plan" becomes a requirement to support the process. The problem for most managers is how to build or start this MBSP process.

Mission, Vision and Principles/ Values

The following 10 steps associated with MBSP represent the start of the building blocks for this process. The final product you are seeking is not a written report but rather a strategic mindset that will change the way you manage your organization, even though a written document is helpful and it perhaps will become the most referenced report in your organization. Figure (2) lists a glossary of terms. The ten steps are laid out in logical order of action. As an example, most organizations already have a valid **mission statement**, supported by a well articulated **vision** and further amplified by sound operating **principles/ values**. I might add that sometimes in order to get people to think and act strategically, an orderly process of going through each step is essential. You will understand very quickly that once people begin to think and act strategically, strategic planning and management is alive in an organization.⁴

Senior Leadership Guidance

Following the completed Mission, Vision, and Principles/Values a through review of the **specific direction given by senior leadership** is required. This review may only include what part of the senior guidance pertains to your organization and what you must do to support the direction being set or formulated. Most often, senior leadership guidance will significantly influence your organization in three areas: a) the operational impact on your organization, b) the probability that the events will materialize, and c) the time frame when the events could develop. Successful direction-setting by senior leadership helps to ensure your mission and vision are:

The Organizational Planning Process

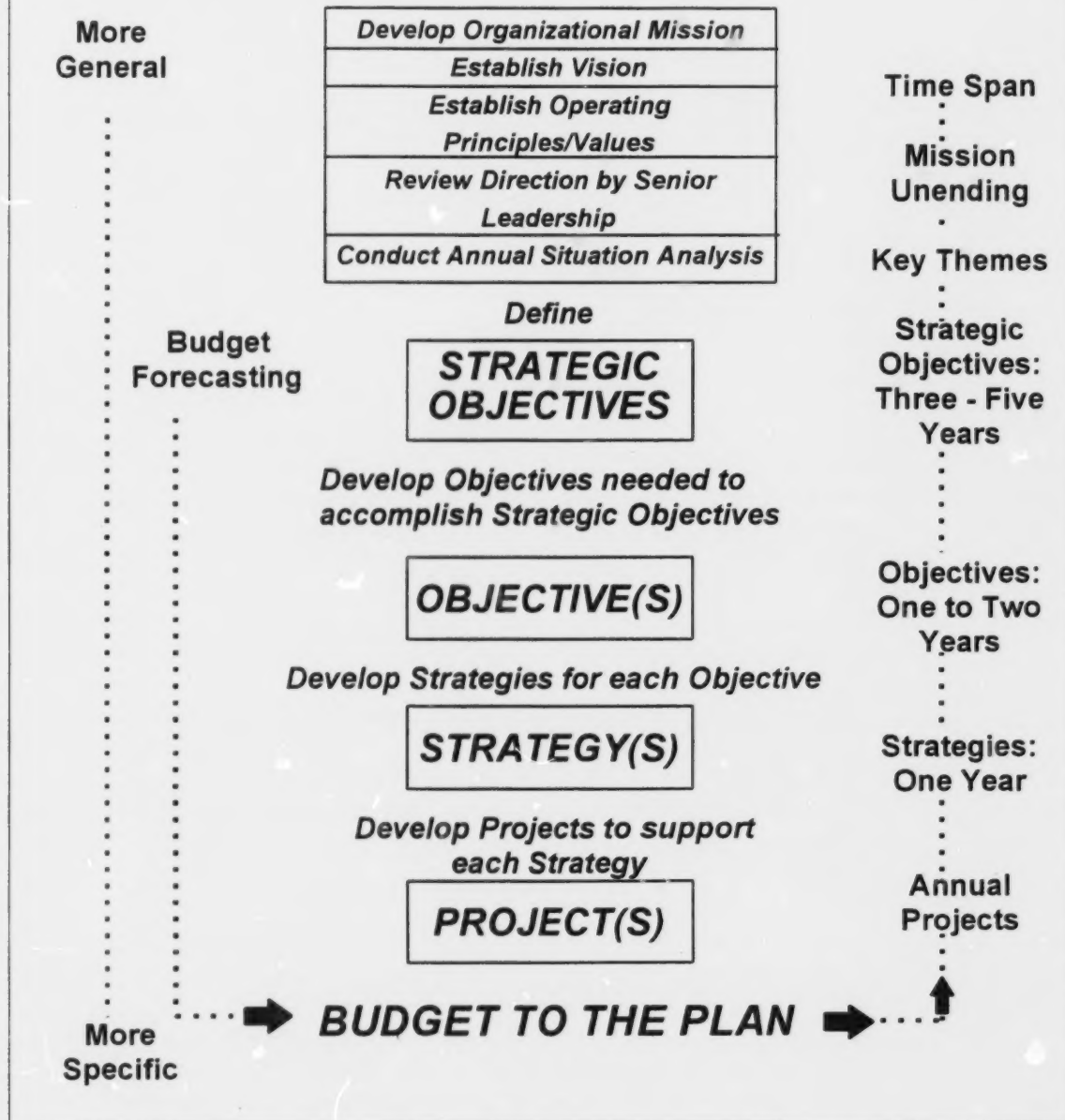


Figure 1.

Project/s	Projects describe what will be done, in what order, by when and by whom. Also, what, if any, additional labor or cost will be required and what results are expected from this plan. It also expresses expected results in quantitative terms (i.e.: cost reduction, expense savings) whenever possible. Completed on Annual schedule.
Cross Functional	Cross functional describes the action of operating across structural boundaries and involves two or more areas of responsibility, either within a unit or between units.
Strategic Objectives	Strategic Objectives define the business scope and specific outcomes that the organization is trying to achieve. Set expectations for the organization as a whole or specific segments of the organization which are realistically achievable. Designed to last about five years.
Mission	Mission is unique to each organization and is the reason for existence. It usually references the products and other basic characteristics of the business. The mission statement should address the questions: what, who, for whom, when, where, and why.
Objectives	Objectives typically pertain to the primary tasks necessary to achieve Strategic Objective. Objectives are stated in specific, measurable outcomes and have time frames assigned (for example, "meet affirmative action goals by next July"). Reviewed on one to two year schedule.
Principles	Principles are fundamental rules, doctrines, or assumptions by which managers and other employees are expected to act. Principles support values and establish basic priorities and fundamental expectations.
Strategies	Strategies are the means for achieving the organization's objectives. Strategies must anticipate the future environment, as well as react to unexpected occurrences. Completed in one to two years.
Strategic Themes	Strategic themes support the University mission with clearly defined themes that confront the strategic decisions facing the organization. A strategic theme fulfills the following criteria: defines the institution's relationship to its environment; takes in the whole organization as a unit of analysis; and depends on input from a variety of internal and external functional areas. Routinely set in place for three to five years.
Values	Values are the basic belief that are most important to your organization and its workers.
Vision	Vision guides where the organization is going. The organization's leadership provides the vision of what can be accomplished and gives a sense of purpose and meaning to employees. Employees must be able to find themselves in the vision. the vision should be inspiring and sustaining. A vision usually looks three or more years into the future.

Figure 2. Glossary of terms.

- Compatible with your organizational capabilities and culture.
- Enhancing cooperation among key constituents.
- Posturing the unit's operation to actual success factors (i.e., those unit elements that separate successes from failures).⁴

Current Situational Analysis

Conducting the **current situational analysis (CSA)** in your organization is the heart of MBSP. The CSA provides information that is used to formulate and support strategic objectives, objectives, strategies and projects.² But most importantly, it helps an organization to evaluate the direction it has embarked on. A key point in MBSP is that plans must be made for "what has to happen," "is happening" and "will happen," that will have both an internal and external impact on your organization. The CSA covers a broad range of environmental issues under the general headings of social, economic, environmental, political and technological trends as well as industry trends. The CSA process is started by conducting a survey or doing environmental scanning of the organization. This scanning process might simply be a better or worse case situation of several alternative trends developed or identified by going through the process.

Strategic Objectives

Once you have agreed on the **Mission, Vision, Operating Principle/ Values**, and understand the **senior leadership guidance and CSA**, the next step is to develop **strategic objectives** for your organization. This is the sixth step in the MBSP process. Strategic objectives are broad statements of what your organization must do to reach its' vision and satisfy the mission. Each strategic objective is compatible with your unit's capabilities, while fostering commitment and cooperation among key members of your organization. Each strategic objective should be focused for three to five years. The developing of objectives as part of step seven is much more focused.⁵

Objectives

While strategic objectives are broad in nature, the identifying of **objectives** pertains to the tasks necessary to achieve each identified strategic objective. Objectives routinely are specific and focus on a single issue, measurable with time frames, each objective should have a desired future state, each objective should have an owner, and revisited every one or two years, if necessary to support a previously identified individual strategic objective.⁶

Strategies

Strategies are specific courses of action in the eighth step that define critical issues dealing with the accomplishment of objectives. Each strategy is creative and flexible, consistent with the unit direction, allows for immediate capturing of opportunities while reducing the threats, and sufficiently action oriented to ensure accountability and cooperation with key staff members.

While strategies support the individual objectives, the identification of projects brings the final agreed upon product closer to closure and should be closed out in one year.²

Projects

Step nine involves identifying **projects** which become individual action items to complete the strategies. They describe what will be done, in what order, by whom and most of all when. In addition, each project specifies resources, describes expected results and expresses measurable results and progress. Each project should be reviewed for progress at least three to four times annually and should be completed within the operating year.⁷

Ownership

All the strategic objectives, objectives, strategies and projects are assigned ownership. This ownership is not assigned for the sake of filling in the block; ownership is expressing total accountability. Accountability, relating to the successful completion of the final project along with receiving and providing guidance at each review step, is another key element of MBSP. The person assigned ownership should be knowledgeable, resourceful, dedicated and most of all willing to accept the leadership tasks of moving each step of the project through to completion. Ownership is assigned up-front and lasts through to project completion. This ownership period can be short, easy and rewarding, while on the other hand it can be long, frustrating and demanding with little rewards involved. Ownership is a privilege and once assigned should not be abused by the individual nor forgotten by management. While MBSP is a practical approach to getting things done, ownership is the tool that makes things happen.⁸

Review Process

The final step is conducting the **review process** (figure 3) for the cascade of activities starting from strategic objectives, objectives, strategies, and down to the individual projects. This review process is essential to getting all project owners, strategy owners, objective owners, and finally strategic objective owners involved in accepting accountability for the progress or lack of progress in the MBSP process.²

Reviews start at the project level and roll upwards to the strategic objective level. Once the projects start, reviews are encouraged on a frequent (monthly) schedule. Strategies are recommended for review on a quarterly schedule. Organizational objectives, and in some cases strategic objectives, are recommended for review twice annually. A suggested progress report format might include the following five parts:

Highlights. These include your accomplishments, key findings and results during previous periods. This section reports the impact of major results.

Lowlights. Included are less successful activities from previous review periods as well as key findings and results. This section quantifies the impact of major results.

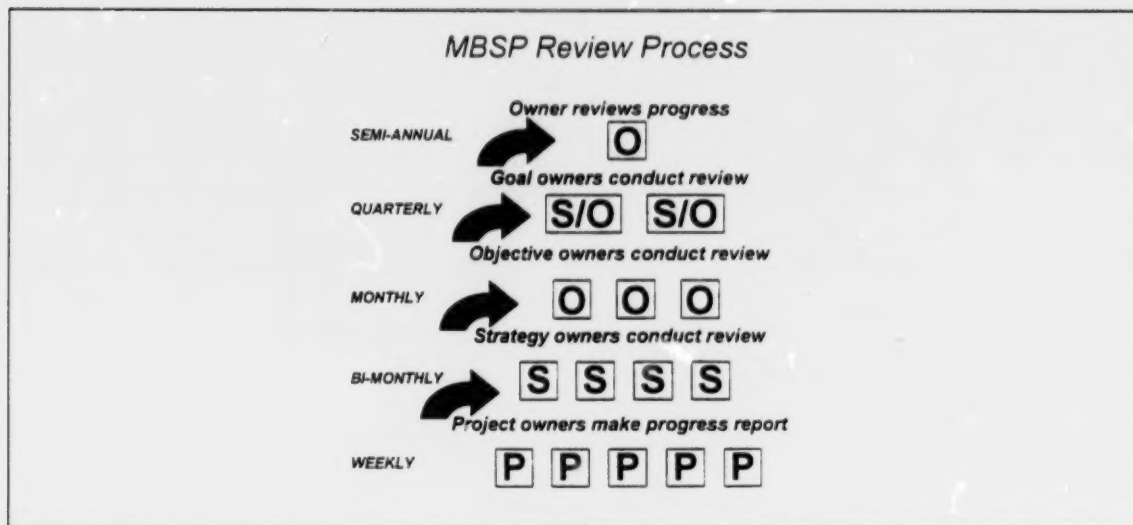


Figure 3.

Issues. This section of the report covers problems that have risen which are beyond the reporter's control or scope of authority. For example, this could include resource allocation, money, head count or time.

Plans. Included are key areas of focus for your next plan period. This portion of the report generates discussion and ensures consistent alignment of activities. It also allows an easy forum to communicate recommendations for future action.

Schedule/Indicators. This section of the report describes the situation as it currently exists. It may include a schedule chart to demonstrate progress, critical points and closing dates. This section in many situations contains data gathered to support change in direction, influence decision making, or a request for more resources.⁹

Performance Planning Reviews

This formal review process becomes an activity to determine if progress is being made, if your guidance is being followed, and how your budget is being spent. An important note is that your strategic plan relates directly to your unit's Performance Planning Review system, yet is another connection to management involvement and confirms adherence to your previously set direction.⁴

A very important part of MBSP is the Performance Planning Review (PPR) system. This PPR is needed to know if the individuals (owners) charged with completing the plan are on track, the projects being completed, strategies being fulfilled, objectives met and if the anticipated results are being achieved. The PPR system is ongoing with all the elements of the strategic planning process.⁴

PPR is started simultaneously with the development of each strategic objective down to the forming of teams for project completion. Involvement of individuals in the process brings the management team closer to the "movers and shakers" in the unit. It keeps the management in

the hands of the operation and actually pushes the accountability to the lowest level in the organization. The PPR involvement process provides a benefit in that it subjects the MBSP process to discussion with individuals in the context of measurable process and allows the personnel to benefit from a strong reward and recognition program.

Summary

MBSP is more than just developing strategic plans. It involves managing your organization strategically. From day to day, you and your management staff must manage your organization so that the strategic plans are implemented and completed.

The glue that holds MBSP together is leadership. Leaders involve people from the top to the bottom of the organization. Leaders help people be innovative and show their ideas. Leaders keep attention focused on the mission while achieving the vision. They also shape the organization so that strategies are carried out. This means examining resources, making changes, developing organizational culture, using appropriate information, and supporting reward and recognition systems.

The major benefit of MBSP is that it helps your organization become successful by focusing on where you want your organization to go (vision) and the many pathways (strategies) you take to get there. Strategic management concepts help you choose the best pathways and the use of resources to get you down those pathways. It gives you an organized process of reaching out to show the organization's mission and future vision, with a broad base of employees ready to be of service to the unit.

Employing MBSP will assist you in developing the organization's reputation as a forward-thinking, knowledgeable unit, resource focused, and flexible, with employee involvement. All of these are admirable traits successful organizations seize the opportunity to build on by utilizing management and planning on the same team. The use of MBSP must ultimately be an active part of the daily operation. It cannot become the **extra thing** to do. It must be **the thing** to do. It is the motivator, the driver, and strongly supported by a desire to achieve the vision set for your Facilities Management organization.¹⁰

Acknowledgments

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Physical Plant: Competing in the 21st Century

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There has been much talk about re-engineering as the saviour of North American business since this technique has been used extensively in the private sector to gain efficiencies and therefore a competitive advantage. Examples of re-engineering in the public sector, however, are not that easy to find.

A little over a year ago the Physical Plant Department at McMaster University came to the conclusion that we needed to critically examine the way we did business. Although many improvements have been made to the operation through the years and the community had a positive opinion of Physical Plant, clearly, to meet the objectives of our mission and improve service with the same or fewer resources we had to look at the basic processes by which we carried on our business.

We saw that there was a discrepancy between how our department was delivering service to the University and the future demands that would be placed upon us by the University customers, by our Physical Plant employees and by external forces. These were:

- A demand for a quality product at a reasonable price, delivered in a timely fashion.
- One stop shopping with improved customer feedback.
- Changing legislation; more regulation with increased accountability of management.
- A changing economic environment; less provincial funding coupled with a declining infrastructure and nonexistent donors for renewal work.
- Competition; more and more University departments were questioning the "value added" component of Physical Plant in comparison to outside contractors.
- Changing staff expectations; Physical Plant employees wanting involvement in decisions that would effect their future.

Our competition was an important factor in embarking on this change process. What competition does Physical Plant have? The large service firms are out there extolling the virtues of privatizing the non core functions of the public sector. Some Universities for instance out-source the cleaning function and other areas. In our area of Ontario a private sector waste management firm is taking over the operation of the water and sewage treatment plants in the region. They are promising not only cost savings but a veritable smorgasbord of economic spinoff benefits

such as locating their head office in the region and spending large sums of money on research and development. How do we compete against that?

It is our collective opinion in Physical Plant that an in house service is preferable to a contracted out service in view of the commitment of staff. But that counts for very little when the dollars are on the line so it means we must be competitive or perish. Chrysler Corporation came to this conclusion a few years ago and decided to become a leader in automotive design by radically re-engineering the way they developed new car models. There is no way they could have achieved their, by now, legendary success by tinkering with their existing system, thus, the reason for our re-engineering. We want to not only compete but also be right up there with the best in our business in terms of customer service and cost effectiveness.

We decided early that expert assistance was needed from a consultant to guide us through the process and facilitate. The book "Reengineering the Corporation" by Hammer and Champy was used as the model. This meant that the process would be bottom up with participation from all groups of employees. The first step was to form a "Reengineering Team" consisting of a project manager, the consultant and a cross section of employees from the department, in our case an equipment operator, a carpenter, a work control coordinator, a supervisor of custodians, the chief operating engineer of the utilities plant, the supervisor of the mechanical shop and most importantly a customer, the operations manager from the department of athletics and recreation.

They met for days at a time throughout the fall of 1993 to examine our existing business processes, select one that was the most important to our success and define what that process should be to make us the best. The delivery of our custodial and maintenance services is our largest process and was determined to be the most important to our success by the re-engineering team. Therefore, they set about to redefine it. Around November, they came up with a proposed new process that they presented to staff in a series of meetings that took an entire week. The information from these meetings was then used to arrive at the re-engineering team's report which comprehensively outlined the proposed new process and the concept for a new organizational structure. See Figure 1 and 2 for illustrations of the existing and the new processes. The features of the new process were one stop shopping for the customer, no or substantially fewer internal handoffs, and more control at levels much closer to the employees and the customers. The intent is that these benefits will foster better communication between all parties and encourage initiative and innovation at a more localized level.

In January 1994 a general meeting of all employees was held to present the report and to set up sub teams comprising a cross section of employees to develop action plans to address a list of issues necessary for the new process to function effectively. Teams were formed for the following: Human Resources, Information Systems, Education and Training, Accounting, Material Handling and Trades Standards. Much time could be spent going into detail on this issues confronted by the above teams, however, all of the participants were important to the ultimate success of the new organization.

After these teams made their reports, the management group worked out the details of the new organizational structure that had been outlined by the reengineering team. A multi-functional team (called service team) organizational structure was developed to deliver the new process instead of the existing functionally divided hierarchy. All Physical Plant operations staff are now divided into Service Teams which are based on a mix of geographic, customer and operational requirements. There are eight teams; five teams to service campus areas with routine custodial and maintenance service, a central team consisting of services that could not be

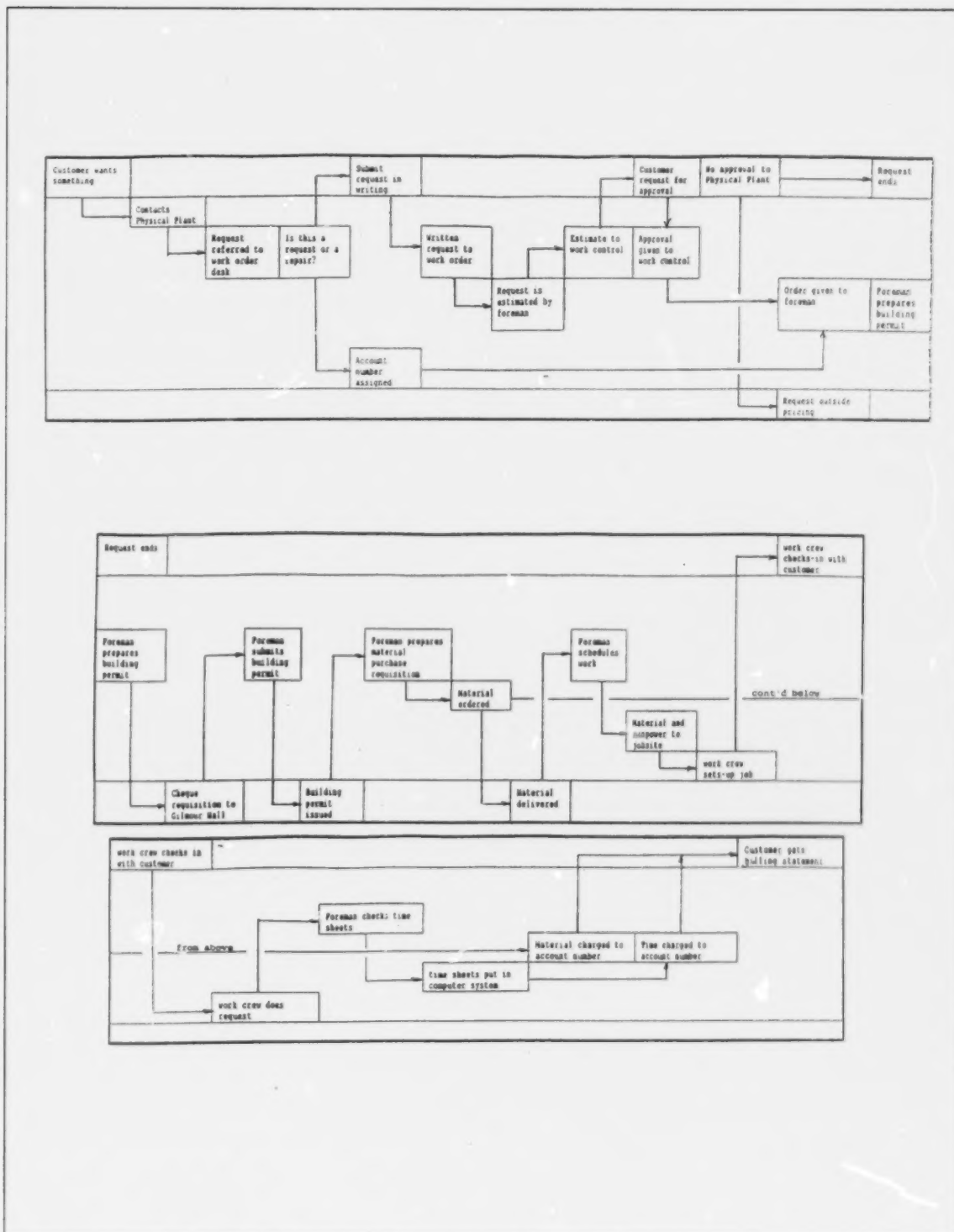


Figure 1.

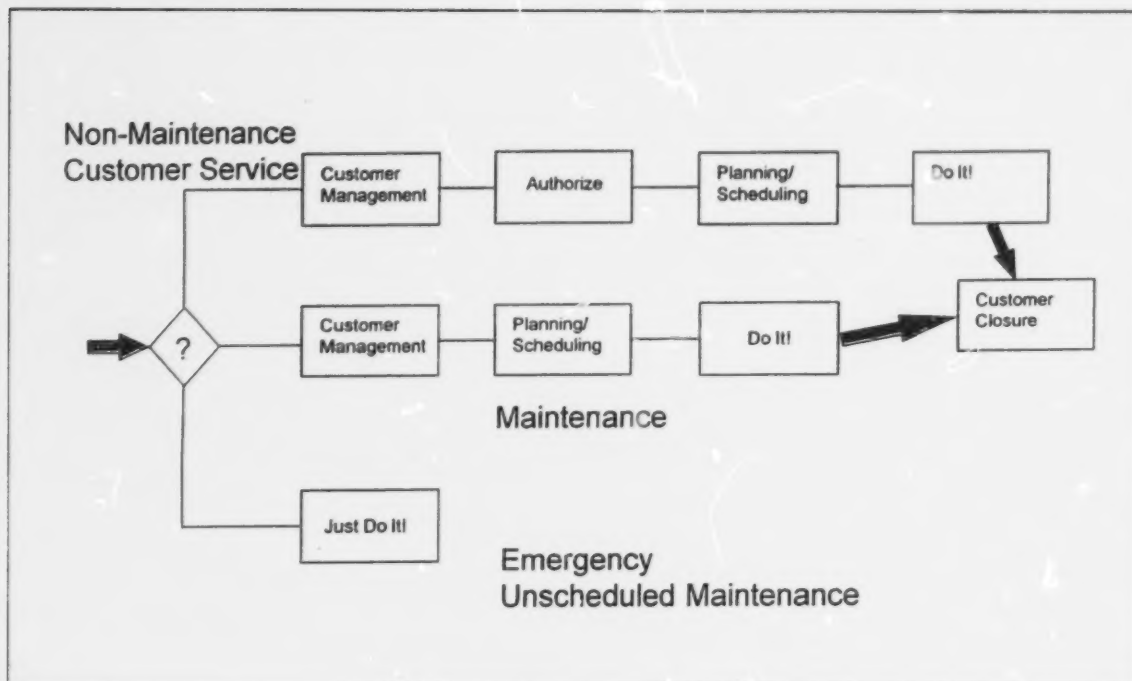


Figure 2.

decentralized (grounds, locksmithing, elevator repair etc.), a projects team to handle renovations and repair projects and a material handling team that encompasses trucking, receiving and stores. The support staff (finance, mis, health and safety, training and clerical support) are grouped into a separate division called Support Services. Utilities and Parking Services remained as separate divisions.

Figure 3 shows the existing organization and figure 4 shows the new organization. The result is that the new organization has 11 less management positions than before (38 versus 49). Some positions stayed the same, however, a substantial number were completely new and of course most existing positions no longer existed.

A well-defined schedule leading to the actual move of the new organization was developed. This was necessary so that the process at this stage did not bog down. We were also well aware that as short a time line as possible was necessary to reduce the uncertainty and emotional stress placed on employees during this period. This was then presented to all employees in a series of meetings in May 1994.

The human resources team developed a selection process to fill the new positions and all management staff were eligible to apply for these first since that group was most affected by the new structure. If they could not be filled from existing management staff then the next group eligible was the unionized staff and failing that the University Community. We also felt that any savings, after satisfying the budget reductions imposed upon us, resulting from fewer positions in management would be transferred to the union staff to get more resources in to the group that actually does the physical work. (More "wrench turning" as we say).

As you can image this was not universally accepted. Some management staff were not happy with the positions they eventually received and two chose to leave the department rather

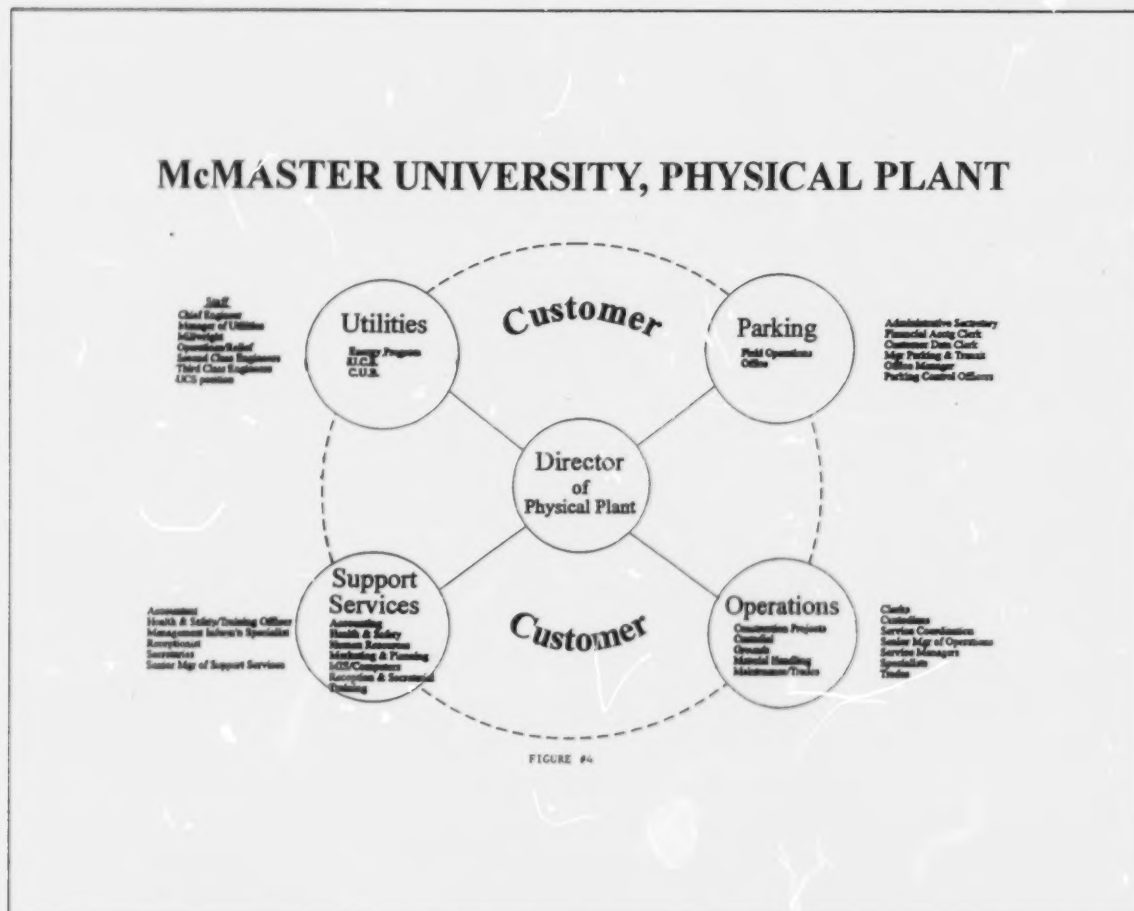


Figure 4.

than accept the offered positions. As it turned out there were more positions to fill in both union and management since eight of nine people accepted an early retirement package that was offered to help us meet our budget reduction target of two positions. Had this not happened there would have been more offers to management employees to take positions in the union group. ("Going back on the wrenches" as we called it).

After the selection process was substantially complete the next step was to decide the staffing for the service teams. This was done by asking the unionized staff to submit their first, second and third choices with the proviso that we would do our best to accommodate everyone but operational effectiveness would ultimately be the determining factor. When this was completed, we were then ready to move to the new organization. This occurred on July 25 resulting in a time line for the initial stage of re-engineering of slightly less than one year.

This was only the beginning however, since we chose to move into the new organization without all the new support systems in place. Some may question the wisdom of this but, when you consider that the staff would have been in a state of uncertainty and emotional turmoil for a much longer time it may have been unwise to delay the move to the new organization while we tried to sweat the details. The many short, medium and long term issues that need to be ad-

needed to support the new organization include cultural change, new accountability and reward systems, new management information systems, education and training, communication, deferred and operating maintenance programs, capital renewal funding (depreciation) and vision and strategic planning. A comprehensive document has been developed outlining the above and the action plan and time lines for implementation. These activities are estimated to take at least two years and in some cases will go on indefinitely, so maybe now it is becoming clear that this whole undertaking is not a short term project.

Now for a discussion of the issues.

Cultural change

Many front line staff are not performing in the way that is envisioned in the new organization such as taking initiative and assuming responsibility for problem finding and solving. Some may not know what is expected or where the organization is headed. For some the old entitlement culture stands in the way (e.g. don't assume responsibility or take ownership). We lack the accountability and incentive systems to support the new behaviour in that it is possible for staff to "dog it" and get the same rewards as others.

To address some of these problems it was decided to conduct an internal attitude survey to see how staff view things and develop action plans based upon the results. The three top concerns identified by the employees were trust, communication with the customer and knowledge and skill of the Service Managers and Coordinators. They were accurate with their observations. It is not realistic to assume that organizing differently and saying we want teams to be self directed will automatically make it so. The staff are really saying we will believe it when we see it. Therefore we feel it is important for our senior staff to work with managers by modeling the expected behaviour and helping them develop their leadership skills since without the Managers being with the program we cannot be successful. Other initiatives designed to address trust and communication will be outlined in the following sections.

Accountability and Reward System

As mentioned earlier this is necessary to reward those who are with the program and provide an incentive to do so for those who are not. First and foremost the new system must hold all staff accountable and reward them for results. Once the required results are identified then the necessary behaviour and training to achieve those results can be developed for each individual. This requires the development of performance measures to adequately identify whether or not the results have been achieved. As well there must be a decision on how much weight will be given to team results versus individual results.

To this end we have been developing results based job descriptions and performance measures starting with the Director's position. To date we have completed the senior managers and the service managers and will shortly be completing the remaining management staff positions. Also, we have been identifying skills necessary for positions covered by our collective agreement. The next step will be to apply the concept to the unionized staff since they have no job descriptions or evaluation system at present.

Probably the most difficult part of this will be implementing new reward systems to suit our new way of doing things. The University has a well defined and long running system which does not fit with what we are trying to do. We plan on working extensively with the Human Resources people to come up with a reward system that will complement the accountability system.

New Management Information Systems

Those of you who have read the book *Reengineering the Corporation* mentioned earlier may recall the discussion on technology and how it becomes a vital component in any process change. In fact many process changes that are designed to result in greater effectiveness cannot work unless the technology is available to support the new way of doing things. Our present systems are archaic and need to be fully replaced with modern systems that will operate on a network. We are looking to develop a Physical Plant Information System that will support our new processes and ensure transparent data transfer between working groups. This system will include maintenance, human resource, financial, payroll and material management. This will be an ongoing project that will take well over two years. At present we are analyzing information system products for maintenance and payroll.

Training Programs

This is a logical extension of the results based accountability and reward system that was mentioned above. We have decided to assess our training needs in view of what knowledge is required for individuals to achieve the results required for their job. Many people have been placed in new positions with no training and minimal management experience. They are committed to the new organization but they do not necessarily have the most basic of leadership skills such as meeting management, labour relations techniques and communication skills. As part of the job analysis the skills required for the position are identified. Comparing the skills of the incumbent with the skills required allows the development of a personal training plan thereby making more effective use of our training dollars.

One of the principles in our new process is to develop staff for more responsible positions as much as possible since this shows that we value them and their commitment to the University. The job analysis provides information about the skills and behaviour necessary to move to the next management level. This allows career paths to be charted through the organization. To this end we have started an apprenticeship program which gives our unskilled and semi-skilled staff the opportunity of acquiring skilled trade status such as electrician, plumber, millwright, carpenter etc.

Committee Structures and Communication Systems

Our new organization has made a number of our old meeting structures obsolete. We needed new structures that emphasized a participatory approach to managing where everyone's input is welcome. In this regard we have initiated meetings at both the senior levels and the Service Team levels. The senior level group is called the joint steering committee and consists of the

Senior managers, Union stewards and the Service Managers. This involves the Union in management planning and so they can be full participants in the decision making process.

The Service Team meetings are held by the Service Managers of each team about every two weeks to discuss team related issues such as customer service matters and organizing to get the work done and include all staff in the team. These meetings are a necessary prerequisite in the ongoing development of self directed teams.

We have also developed a monthly newsletter called the Bridge to assist in communicating not only business related issues but personal interest stories about our staff as well. All staff are encouraged to contribute by alerting us to areas of interest and by writing articles. A three member group which includes Union representation serves as the editing body.

All of the information we have read in our journey is consistent in saying that good communication and lots of it are essential to any change effort. There are several forms of communication such as the written or spoken word. There is another form that is sometimes neglected and that is what we communicate by our actions. Senior staff can undermine change quickly by engaging in behaviour that is inconsistent with their words. We feel it is important that we "walk the talk" by modeling behaviour for our staff. You may recall this was mentioned above where the issue of culture was discussed.

Funding

All of our efforts to effect a meaningful change in the way in which we deliver our service to our customers will be wasted unless we convince the governance of the University that they are underfunding the upkeep of the physical assets. We have, therefore, presented a comprehensive zero based budget strategy which covers operational considerations as well as deferred maintenance, and capital renewal.

We have completed a facilities audit of all academic buildings on campus which show deferred maintenance to be around 25 million dollars and the capital renewal requirement to be about 12 million dollars per year. This of course far exceeds the existing funding for facilities.

Traditionally our department has not had a predictive and preventive focus to maintenance and we see this as an impediment to effectiveness and customer service. We have therefore included in our funding model the costs of implementing a comprehensive preventive maintenance system for our facilities. In addition we are developing a predictive maintenance system where the information available from our direct digital control system (DDC) will be used to predict maintenance requirements and component replacement. This will require an extension of the DDC system and an interface with the Maintenance Management system that is eventually selected so that the information can be incorporated into service team work schedules directly.

All of the above was used in the our three year budget submission resulting in a recommended budget increase of 10% in year two and 25% in year three. The President's Budget Committee recognized the significance of managing our facilities effectively and has authorized us to work with other departments in order to identify strategies for meeting the funding recommendations. One of the strategies is to improve our own efficiency in the delivery of maintenance by more effectively planning and scheduling work and to reduce overhead costs associated with non-productive time.

Visioning and Strategic Planning

We should keep in mind that re-engineering does not guarantee effectiveness, competitiveness and success. It is simply one piece of the puzzle that must be put in place to allow the attainment of the general goals of the organization. Gary Hamel and C.K. Prahalad say in their Harvard Business School Press article *Competing for the Future* that in a few more years, having sound business processes will not be a competitive advantage since most organizations will have them. It will simply be one of the mandatory entry tickets into the marketplace. The following quote from the above article sums it up nicely: "Our premise is that a company can control its own destiny only if it understands how to control the destiny of its industry. Organizational transformation is a secondary challenge. Getting to the future first is not just about outrunning competitors bent on reaching the prize. It is also about having one's own view of what the prize is."

We can now see that change through continuing visioning and planning will be necessary for us to be competitive over the long haul. In other words, we must continually create our future and will never be finished with change. This means we will embrace the concept of continuous improvement to ensure our processes and services continually evolve to address the needs of our customers even before they become aware of their needs. To use an analogy from one of our staff, "you can't drive a car by looking in the rearview mirror".

We have not covered every issue that must be dealt with in the reengineering of our department but we do hope that you now have an appreciation of the magnitude of the undertaking. It takes a lot of hard work and stamina to stick with the program when resistance to change from the culture appears. It requires new attitudes and new ways of doing things at all levels of the department and an acceptance that now that we have embraced this concept we will never be truly "finished". Obviously, this process is not for those who must have closure.

Rightsourcing Your Facility Services

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The idea of outsourcing facility services still attracts senior managers seeking to improve performance, lower costs, and reduce staff. The fact is that many institutions do benefit from outsourcing. Others learn too late that an uninformed outsourcing "solution" can create new problems—even produce outcomes opposite from those intended.

Outsourced or in-house facility services: which are better? Research shows that across-the-board insourcing or outsourcing of facility services is seldom the optimal means of providing economical, high quality support to the enterprise. What works best is a disciplined, systematic, and continuous balancing of business values and operating economies. This strategy is called "rightsourcing."

Any value delivered to the parent institution by "rightsourcing" facility services depends on the facility manager's ability to retain and improve the "right" functions in-house, while contracting the "right functions" in the "right manner." But what is "right?" And is there an approach to rightsourcing that consistently works better than others?

This article answers these and other questions about successfully using a business-based method for making sourcing decisions in a fast-paced change environment. The "rightsourcing strategy" can help save money while achieving business objectives. It is also a strategy of how not to provide the services that divert an FM (facility management) organization from cultivating its critical skills - services that contractors could do more efficiently. The approach is based on a few simple principles:

- Facility Officers who focus their efforts on improving the delivery of facility services can often achieve results comparable to the best available vendors. In many cases, they can secure the results with less disruption to the parent institution, and at less cost than the hiring of an outside firm.
- Facility Officers should focus on improving those services that are or may become critical to the parent institution. Where possible, deliver these services in-house with the best employees. When outsourcing a critical service becomes necessary, use a partnering approach rather than low bid competition.
- Avoid major investments in improving non-critical FM services. Outsource as many as can be justified and use low bid competition rather than partnering approaches. Shift the best people and management talent from outsourced services to improving delivery of strategic services.

- Rely on competition of non-critical services with the commercial sector as a means of generating employee commitment to improving in-house performance.

Why Rightsourcing?

Between 1989 and 1992, I observed that facility managers were spending a great deal of time in efforts to forestall or react to imposed downsizing and budget crunches. In many of these instances, I believed that the efforts - whether TQM or reengineering projects to improve in-house service delivery, or contracting initiatives to outsource facility services - had been adopted merely as quick fixes and without due diligence.

Did these in-house improvement efforts and outsourcing drills, however successful, warrant the time devoted to them? Had people focused on improving in-house delivery of "non-strategic" services which had little material impact on the destiny of the FM organization or its parent institution - services that might be provided by any number of contractors? Or had people relinquished to outside vendors control of services that are critical to the parent institution's competitive position?

The continued existence of many large, in-house FM organizations is becoming increasingly dependent on becoming or remaining the parent institution's provider of choice for "strategic facility services" - support that senior business managers and customers consider important. As downsizing becomes a systematic, on-going activity, few Facility Officers can afford wasting management time and limited resources on improving non-strategic services that an outside vendor could do - especially at the expense of "strategic facility services."

FM organizations often continue providing these non-strategic services out of a sense of corporate responsibility - namely, a desire to preserve jobs. Nevertheless, a strategy predicated on preserving jobs often results in insourcing services that are easy to provide, sometimes just to make work, while outsourcing those that are hard to provide. Over time, fixed costs rise, service differentiation declines, and performance remains stagnant as employees remain complacent. The FM organization becomes less competitive and its very survival is threatened.

Unwinding & Overinvesting

In time, I decided to look more carefully at organizations facing the same dilemma. Between 1992 and 1994, I studied fifteen FM organizations - all in the kinds of institutions and businesses that are being squeezed by downsizing pressures. What were the sourcing policies of those organizations?

My investigations produced interesting findings. First, a large percentage of companies have outsourced one or more facility service only to bring the service back in-house at the first opportunity. Reasons given for such reversals were often the same reasons that drove the outsourcing in the first place - to reduce cost, and to improve quality. The most fascinating aspect of these so-called "unwindings" was that the unsuccessful outsourcing ventures were not concentrated on any particular service categories. For example, services like HVAC preventive maintenance (PM) and food service were successfully outsourced by many firms, but not by others. It appeared that what worked for some firms simply didn't make sense for others.

A second finding was that many of these FM organizations have systematically overinvested in the improvement of in-house delivery of non-strategic services and have neglected de-

veloping the essential services that could, and must, become the basis of future survival. Nor was the reason for over-investment the inevitable consequence of some other strategic imperative. Usually it was the result of confused thinking about comparative advantage, contractor management, and economies of scale. Again and again, facility managers would offer explanations such as these: "Space remodeling is a popular offering - so we kept it in-house to remain responsive - especially after we discovered excess capacity in the carpentry shop. But mechanical maintenance is a real hassle - we're always fighting scheduling conflicts with remodeling jobs, so we found a contractor to do the maintenance."

Superficial Concerns

Complaints, "hassles," too many details. Rarely was there an effort to place facility services in an order of strategic importance; nor was there much discussion of potential contractor capabilities or of services at which the FM organization needed to be adept. The price of such oversight, however, is costly: an eroding capability to provide services that are critical to the parent institution's competitive position - a deteriorating skill level to wage ratio relative to contractors who pay half the wage rate and take on the difficult work; and a low rate of improvement in performance as management attention and resources are spread thin across many services.

Why do intelligent, experienced, and dedicated managers make such decisions? My conversations with many managers ranging from shop foremen to top managers elicited some general reasons:

- The parent institution pursues multiple and conflicting sourcing strategies.
- Facility managers fear being exploited by opportunistic contractors.
- Facility managers lack an appreciation for the opportunity cost of management attention and resources; antiquated cost accounting systems do not help.
- Employees are concerned that outsourcing will "empty out" the FM organization.
- Each of these reasons merits closer attention.

Conflicting Sourcing Strategies

Facility Managers were discouraged by the lack of coordination and conflicting sourcing tactics within the parent institution. Some managers justified insourcing by pointing to the savings that could be realized by filling idle capacity in their shops; especially during downturns. Other managers preferred to outsource; they found external contractors were often more responsive to their customers than internal workers. Managers concerned with labor relations favored insourcing to preserve jobs and maintain cordial relations with the union.

In addition, many managers have a strong incentive to insource FM services. After all, more services mean more responsibility, more authority, and bigger salaries. Moreover, the managers making the sourcing decisions are often the same people who have to evaluate the outcome of these decisions. Seldom was there an unbiased audit to bring accountability to the sourcing process.

Distrust of Contractors

Many managers seemed to take it personally that an outsider could outperform the in-house FM organization - though an impartial observer could see why it might. In general, contractors could pay lower wages, had less overhead, utilized the same technology and their employees had strong incentives for productivity improvement and customer service. Furthermore, despite much agreeable talk about "partnership," facility managers still felt most comfortable with short-term contracts awarded on the basis of price. In turn, perhaps as a consequence, contractors tended to engage in opportunistic behavior; raising prices when they felt most needed and favoring other FM organizations who were more attentive to their margins.

Unappreciated Opportunity Costs

Few facility managers seemed to appreciate the true opportunity costs of such intangible resources as management attention and engineering talent. They failed to realize that their "we can do it all" mentality was, in effect, depleting the limited energy their people had for responding to customer demands, let alone strategic thinking. They might agree that focused attention was necessary for superior service performance, yet their efforts to make across-the-board improvements were ineffectual. As a result, frustration levels mounted as employees combatted ineffective and archaic processes.

Their financial reporting systems did not help much. Most were traditional cost accounting systems for distributing overhead costs across all facility services rather than an activity-based system that might have provided managers with more accurate information: what services really added value, what costs really drove overhead. In the face of distorted cost structures, sourcing decisions were made largely on emotion and myth.

Fear of Emptying Out

There was a general apprehension that outsourcing would actually reduce the FM organization's ability to support its parent institution, not augment it. This sense of worry, however, had no basis in fact, except in a few cases where senior institutional and business executives were naively suggesting the unstudied and monolithic outsourcing of all FM services. The idea, rather, was to subcontract non-strategic services to qualified contractors better priced to perform them and to focus in-house management attention on services pivotal to parent institution success.

The Root Cause

Underlying all these apprehensions was a more steadfast anxiety, namely, that FM organizations had no firm basis for distinguishing strategic services from non-strategic services. The generalized concern of managers for outsourcing derived from the lack of a clear and shared understanding of what services were strategic. Managers feared that they lacked the analytical tools to make the necessary strategic distinctions and the resolve to act on the implications of such analysis.

The more I thought about these attitudes, the clearer it seemed to me that the prejudices both for and against outsourcing derived from this final uncertainty. Managers would always

face conflicting corporate strategies, reservations about contractors, uncontrollable economic conditions, and fears of emptying out; nor did they need to be convinced of the prudence of focusing on strategic competencies to reduce investments in improving FM services and reducing costs - obvious advantages in future survival. What managers lacked was the confidence that they could make strategic discriminations among the many facility services they knew mostly in terms of cost and function, not importance to the parent institution.

The cure, I concluded, was not an abstract appeal to implement strategic planning but an actionable logic - a new thinking process that could be applied to whatever situation might exist in the parent institution. The problem was to think strategically. The task was to reduce strategic thinking to practice - a task not to be performed by facility managers alone but rather by a collaboration of senior institutional or business executives, facility managers, in-house customers, and purchasing managers.

The Strategy Evolves

The first thing to do is review each service in the institution's inventory of FM services and get institutional top management's views of which services are indispensable to the parent institution's competitive position. This distinction is the key to successful strategy because the insourcing and outsourcing decisions and methods for a strategic service are different than those of a non-strategic service. These differences necessitate different approaches to developing business cases. If the wrong approach is applied to the wrong type service, unwanted results will be produced.

The choice of strategic versus non-strategic will vary from institution to institution because the two types of facility service ultimately drive parent institution success in different ways. For example, although both Institution A and Institution B maintain a vehicle fleet, Institution A might decide that oil collection at institution garages is integral to its public image. Institution B might decide its image bears no relationship to oil collection.

As a result, Institution A has developed a long term partner relationship with an oil collection vendor, while Institution B uses low bid, short term contracting. This is not to imply that one institution or the other is wrong - it simply demonstrates different priorities.

In general, institutions must first answer a tough question before they classify facility services as strategically important. Various suggestions and theories have been forwarded to help the facility manager determine if a particular service should be classified as strategic or not. From my viewpoint, there is only one criterion:

A strategic facility service is one that the parent institution's senior business managers perceive to have impact on the parent institution's competitive position, or on the safety and well-being of its employees.

The emphasis here is on senior management's perception. All other criteria fall by the wayside because experience shows this to be the only consistent ingredient of successful outsourcing decisions. If senior managers consider a particular service as strategic, the facility manager will find himself having to treat the service differently in the outsourcing decision process and in the delivery of the service through the chosen source.

Of course top management perceptions are influenced by the Facility Officer's customers and certainly can be influenced by the Facility Officer himself. Which brings us to the main

point of this article: unless the Facility Officer plays an appropriate role in the parent institution's strategic business planning arena he will not have the confidence or ability to make strategic discriminations among facility services.

Neither will he have the opportunity to vie with other departments to properly balance senior management's perception of facility services. Lacking the needed confidence and ability, he and his organization will be hard-pressed to develop a proactive sourcing strategy capable of withstanding coming storms.

Profound Knowledge: The Core Business Value Of FM

Of course, there are those who would claim that leaving the call on FM service criticality to business managers will only expedite service commoditization and the "emptying out" of the FM organization. If the FM organization and its internal customers were to source custodial services from the same contractor, how would the results be different in the eyes of the customer? If the FM organization and any other department can both buy custodial services from the same contractor, wouldn't the business value of the FM organization be virtually indistinguishable? Isn't the custodial contractor the only victor in this process?

This is a very critical argument and raises an important distinction between actually performing a facility service in-house and controlling its delivery by remaining expert on what may be called "profound knowledge" of it.

Profound knowledge is the intimately detailed and specialized power of translation required to capture customer requirements and reproduce them in the language of service performance specifications. It is based on many detailed understandings of the linkages between user requirements, service parameters, and performance specifications; it is unique to each FM organization, intuitively developed in countless conversations with top managers, customers, and contractors, and gained through experience.

In the provision of custodial services, for example, the customer's requirements, such as areas to be cleaned and levels of cleanliness are mapped into service performance specifications - frequency and performance standards - which, in turn, are decomposed into specifications for either in-house or contract execution. It is the depth of this knowledge that determines the user's experience with the service. It is what makes the service distinctive.

This knowledge makes the FM organization's provision of service potentially more efficient, reliable, and cost-effective than any other way of providing the service - even though all competitors may offer identical results. The Facility Officer's understanding of what customers expect from a janitor and his knowledge of how to translate customers' needs into performance specifications will be different from the procurement specialist and internal institution customer. This difference will be manifested in many subtle (and not so subtle) differences in the content of the contract, the quality assurance plan, and the results achieved.

And so when capable service contractors exist, it is not so important to be able to perform the service in-house as it is to have the ability to specify the performance characteristics of the service and to ultimately regulate its delivery. Of course, carelessly executed, the outsourcing of facility services can result in the loss of profound knowledge within a short period of time. Lost profound knowledge has always been difficult to get back.

Institution C offers a good example of what it takes to preserve and nurture profound knowledge. When the Facility Officer at C made the decision to source HVAC PM from a contractor,

he simultaneously assigned an engineer to work closely with the contractor engineers. This in-house engineer retained the ability to analyze manufacturers' recommendations, validate contractor-generated PM tasks, review equipment performance, and maintain component testing technology. Meanwhile, the contractor assigned its own engineers to periodically visit Institution C's engineer to facilitate closer communication and cross-fertilization of ideas. Institution C's Facility Officer believed that such a "partnering" arrangement was much more cost-effective in the long term than a tight-spec, "hold their feet to the fire," low bid approach to outsourcing. They were also willing to pay the up-front premium to go that route.

The Business Case For Sourcing "Core FM Services"

The classification of FM services as strategic and non-strategic is the beginning of a decision tree that can become a map of an FM organization's entire strategic sourcing process. (See Figure 1, "The Rightsourcing Process.") I call "Core" those strategic services that are now being done in-house. These are the services that the FM organization must be distinctively good at providing, and this is where the bulk of the investments and best talent should be directed.

The underlying approach to Core services is: "Because we need to be distinctively good at providing these services, we must retain our profound knowledge and management control. Our goal is to be providers of choice for our customers. Where possible, we will deliver these services in-house with the best employees. If the business case is overwhelming for outsourcing we will use a partnering approach rather than short term, low bid contracting."

Major services that top management considers strategic should normally be insourced. But not always. Here managers need to jump-shift from a consideration of strategic importance to delivery methods. More precisely, facility managers need to look carefully at services and group them into "bundles" demarcated by the resources and processes needed to deliver them - space renovations, carpenters, plumbers, electricians, and job planning, for example; or HVAC maintenance, air-conditioning mechanics, parts expeditors, and computerized maintenance management systems. Then they need to decide about the cost-effectiveness of continuing to invest in the capacity to sustain each "service bundle."

If once managers said, "Sign painting is a low-volume bother, let's find a contractor to do it," now they might say something like, "Let's group all painting into a bundle and make a sourcing decision about the whole bundle."

What decision? Once again, there is a distinction to be made, only this time the critical question is not, What functions does top management consider strategic? but rather, How can we become/remain the provider of choice for a strategic service? The basic idea here is to aim for in-house excellence where possible and partnership with contractors where necessary. The general questions to ask are: What is the business case for continuing to perform in-house? What is the business case for partnering with a vendor? Is partnering justified? The specific analysis needs to explore the business questions in Figure 2, and will produce three categories of Core services: STAR, GEMSTONE, and PARTNER.

- **STAR** services are high performers in terms of both quality delivery and cost effectiveness. These are the strategic services that customers rave about and can't get enough of. Facility managers should hold these up as shining examples of the value of FM to the par-

THE RIGHT SOURCING STRATEGY

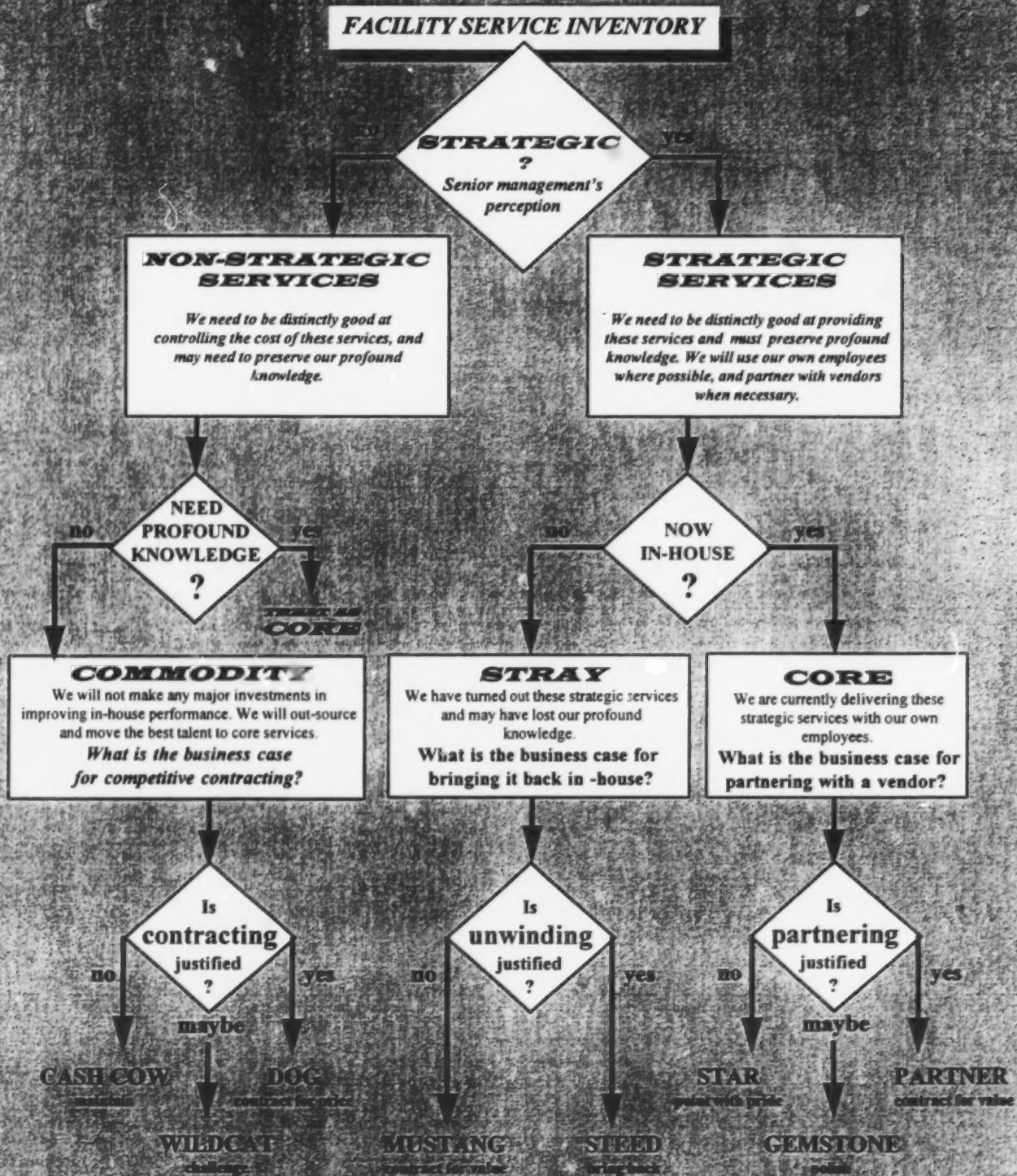


Figure 1

THE BUSINESS QUESTIONS

Whether or not a service is deemed strategically important, three critical questions must be answered to build a business case for its ultimate disposition. The manner of asking these questions, even the order of asking them, will differ for strategic and non-strategic services because the ultimate objectives and options differ among the two categories.

QUESTION A: CURRENT PERFORMANCE

What is the current level of service performance perceived by senior business managers, internal customers, and the facilities organization? Is this acceptable to top management?

QUESTION B: RISK OF CONTRACTING

Does the nature of the service lend itself to performance by contract? A rather simple two-step evaluation can be conducted:

1. Can the scope of work be clearly specified both quantitatively and qualitatively?
2. Are procedures available to objectively measure and evaluate performance?

QUESTION C: VENDOR AVAILABILITY

What are the capabilities of potential contractors relative to the FM organization?

Objective answers to these three questions will determine whether to in-source or examine further for outsourcing. A definitive answer to the outsourcing question depends on an answer to yet another question:

QUESTION D: COST EFFECTIVENESS

What would it cost to catch up with the best of available contractors, can the parent institution afford it, and will the return on investment justify the effort?

Figure 2.

ent institution. He also needs to focus sufficient future efforts and resources on maintaining the STAR status.

- **GEMSTONES** are those that, with a little polish, could be STARS. Here is where the Facility Officer should be investing in TQM, process reengineering, and other high cost/high return improvement projects.

- **PARTNERS** are strategic services where internal capabilities have eroded to the point of uncompetitiveness. Rather than spend enormous time and money trying to catch up with available contractors, the best policy here is to close the internal operations and free up ceiling points and management talent for STARS and GEMSTONES.

If internal capabilities to provide a particular strategic service lag behind those of potential contractors, FM organizations face a difficult choice - to try and close the gap or to "pull the plug" and outsource the service. As one Business Officer describes this choice, he emphasizes the need to consider the financial strength of the institution and the alternate uses of the resources. A stronger balance sheet gives Institution D a better shot at closing in-house competence gaps than, say, Institution E. However, managers at D may still be confronted with an unpalatable choice: to attempt to close the gap or to outsource and push for improvement in another strategic service.

This is an emotional decision for most managers. Even though traditional competencies may have eroded, FM organizations have a deep psychological reluctance to abandon them to a contractor. Managers at Old Dominion or Commonwealth may find it difficult to accept the argument that outsourcing a traditionally valued service like, say, HVAC PM would let them focus more management attention and resources on custodial services. Facility engineers at another institution may balk at outsourcing HVAC PM to devote more attention to space renovation. Where a significant competence gap exists, managers are better off partnering with a capable contractor.

At the same time, the FM organization that gives up a strategic service to a contractor should concurrently strive for excellence in a different strategic service, preferably one of importance and high visibility to top management. If a facility manager, for example, decides to source sewer line cleaning services to a contractor, it might now be improving landscaping services instead.

The Business Case For "Strays"

The term "STRAY" means we have outsourced a service that senior management considers critical to parent institution success. We may have already lost control and maybe even our profound knowledge.

The approach to STRAY services is: "If at all possible, we must recoup our profound knowledge and management control. Where possible, we will bring these services back in-house. If we cannot afford to bring it back, we will continue to outsource using a partnering approach rather than short term, low bid contracting."

The general questions to ask are: What is the business case for bringing it back in house? Is unwinding justified?

The specific analysis also needs to explore the business questions in Figure 2, and will produce two categories of strays: **MUSTANG** and **STEED**.

MUSTANG is the category that is irretrievably beyond the point of cost-effective unwinding - just too much time and trouble to bring it back and tame it. Continue to outsource the **MUSTANG**, but consider converting to the partnering approach and taking other action in order to retrieve or preserve profound knowledge.

The STEED, on the other hand, is well-worth the effort and cost of capture. Unwind the STEED and bring it back in-house as soon as possible.

The Business Case For Non-strategic Services

What of the services that top management considers non-strategic? We need to be distinctively good at controlling the cost of these services, but we don't necessarily have to be the providers. However, we may need to retain our profound knowledge of some of these services for an number of reasons. For example, a service could be so complex that even writing a good specification or QA plan for successful competitive contracting is a challenge. Or, senior management could one day decide that a service is really strategic and ask that we regain management control.

Any services that require special consideration to preserve profound knowledge will be treated as Core services and the business cases evaluated accordingly.

Those that do not involve preservation of profound knowledge can be treated as commodities - services that can be delivered by any of a number of available competitive sources. For Commodity services, we will not make any major investments in attempts to improve in-house delivery, but will outsource where possible and move our best talent to CORE services. The approach for these commodity services is "What is the business case for contracting as soon as possible?"

Perhaps the best way to deal with these Commodity services was conceived by managers at one of the companies I studied. Managers at Karson (disguised name) broke down their Commodity service portfolio into bundles based on common delivery process characteristics, trades, and materials. They then classified service bundles in terms of their in-house capabilities: the amount of capital required to become competitive, the technical and administrative people required to make the services viable, the time it would take to achieve proficiency, whether expected return on investment was high or low, and the percentage of existing work represented by the process.

Based on this analysis, service bundles were classified into three categories with familiar-sounding, if not precisely descriptive names - CASH COW, DOG, and WILDCAT.

- **CASH COW** Internal sourcing is clearly competitive - cost advantage over contractors is 15 % or more. Service processes are capable and rate of improvement is high.
- **DOG** Internal sourcing is clearly uncompetitive. Cost advantage of over 15 % can be reached through outsourcing. Fixing in-house service processes will require significant capital and resources.
- **WILDCAT** Internal sourcing is marginally competitive; that is, cost advantage is less than 15% over contractor. Physical assets and equipment are reasonably capable. A large improvement in labor productivity is necessary, but this could be achieved through training, limited process improvements, and employee involvement rather than capital investment.

For CASH COW and DOG services the next step was clear. CASH COWS would continue to be performed in-house, at least for the present, though a case could be made that Karson should stop performing them in the long run so as to direct all investments and management attention toward strategic services.

DOGS would be considered for possible elimination and the survivors outsourced as soon as possible to the low bidder using tight specs, and a good QA plan. But what of WILDCAT services? Here is where things got unexpectedly interesting.

The Karson FM organization provided about 20 different services. It had grown through incremental additions of new services, and over the years, FM personnel had dealt with the complexity that resulted by staffing to peak workload levels.

Labor relations at Karson were cordial, but no significant effort had ever been made to involve FM employees in improving service processes. Nor did hourly employees feel any significant need to improve; wages were good, and most of the workers believed that they would be not be laid off during industry downturns.

On the whole, then, this was the kind of FM organization that was a prime target for downsizing - an overhead group where productivity growth was stagnant, where all manner of management programs to improve quality and implement better practices had been resisted. It was against this backdrop, in fact, that the senior executive at Karson commissioned a team to determine the competitiveness of each non-strategic FM service relative to potential contractors. The team - comprising a facilities engineer, several trade supervisors, a cost analyst, and the purchasing manager - reported to a steering committee comprising the senior manager and the directors of purchasing and facilities management.

Karson discovered that 30% of its Commodity services were uncompetitive, 40% marginally competitive, and a mere 30% of the Commodity services were truly competitive - although even these lines needed improvements, which had not been attempted because resources and management attention were being squandered on the least competitive services.

Karson management realized that a decision to outsource DOG services could be used to precipitate a crisis atmosphere, one that would allow the plant to make headway on WILDCATS. A commitment to not providing commodity-like services that contractors could do better might get the attention of employees. So management gave employees one year to meet external benchmarks for quality and cost on WILDCAT services - or those services would face outsourcing. Any loss of jobs would apply to salaried workers as well as hourly workers.

Joined for the first time by a common destiny, line managers, engineers, and tradesmen capitalized on their profound knowledge to achieve real improvement. They benchmarked potential contractors and began developing a vision of how to organize and manage for competitive servicing. Gradually, hourly workers began to get involved in the project. They started making changes to work planning, methods, processes, and training with increasing vigor. The critical task was to use the organization's dormant profound knowledge to retain the WILDCAT services for in-house performance.

Within 18 months, all but two of the service bundles had moved from WILDCAT to CASH COW. Several DOGS were eliminated and most of the remaining were outsourced. Meanwhile, Karson developed a retraining program for selected high performing employees and transferred them into Core areas as their old positions disappeared.

Concurrently, purchasing managers changed the way they dealt with contractors to accommodate the larger number of purchased services. They introduced a rigorous contractor selection system and started awarding contracts to more capable and cooperative contractors, rather than to contractors who submitted merely the lowest price. As a result, they rationalized the supply base to 50% of what it had been. They also obtained volume discounts by sourcing out entire bundles of services rather than individual services.

Karson's method may not be precisely transferable to institutions of higher learning, but its principles of action certainly are. The main idea is not to use the threat of outsourcing to bludgeon employees into submission so much as to develop a clear and shared understanding of internal competencies, a common understanding of the services that are vital to the institution, and an urgency around the need for improvement.

Some Facility Officers may find it inexpedient to put their organizations on a war footing the way managers at Karson did. Even so, once they have developed a clear strategic direction, they can pursue sourcing more opportunistic. With every new customer need or request for service, for example, Facility Officers may be able to make the appropriate set of sourcing decisions to get their organizations closer to the right degree of vertical integration.

The Challenge

What I'm suggesting is not an outsourcing program, although functions will be outsourced. Rather, it is a strategic approach to efficiency that is built on competition. Because it has the potential for affecting jobs, and organizational performance, it can be highly controversial with employees, unions, contractors, facility managers, and top management. Intelligent execution of rightsourcing provides significant efficiencies and delivers value to the parent institution, thus ensuring the future of the FM organization.

Moreover, the kind of analysis I have described needs to be an ongoing process rather than a one-shot deal. The inertial forces that operate in large, complex organizations tend to distort the resource allocation process over time. Unless managers periodically reexamine how they make sourcing decisions - and how resources get allocated - they can find themselves once again overinvesting in commodity services and starving what is strategic.

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A Rental Model For University Space

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I. Introduction

The University of Waikato, of some 11,000 students, in Hamilton, New Zealand is the newest of New Zealand's seven universities. There are about 120,000 people living in and around Hamilton.

Hamilton is located about one and a half hours drive from New Zealand's largest city, Auckland, which has a population exceeding one million.

Tertiary education in New Zealand is administered by the government's Ministry of Education, a policy setting ministry. In addition to the seven universities, there are 25 polytechnics, and five colleges of education (teachers' colleges).

State funding to all of the tertiary institutions is through a simple concept of providing a certain sum per year for each equivalent full-time student, or EFTS. There are differential rates for different courses e.g. Engineering and Medicine are funded at higher levels per EFTS than Management and Liberal Arts courses. There are no supplementary funds available to the University other than those which it earns itself. For example, it actively seeks to enrol full fee paying students from overseas countries, it attracts funding for research projects on a contract basis, and it earns money from a variety of services, such as use of facilities by conferences, printing services, and sale of computer hardware and software. Whereas in the 1980s most of the University's income came from the government, the government's reduction in support for students, and the university's approach to income earning activities is such that only 52% of its income now comes from the EFTS based system.

The Government's level of support per student has been reducing. Currently, students are required to pay a fee equal to approximately 25% of the real cost of tuition. There is a system of income support for students from low income families and a taxation related loan scheme to help students pay their fees and study costs.

All these funding changes have occurred since 1990, when there was a major change in the administration of education in New Zealand. This too was part of a major change in the general approach to government and financial management of New Zealand which started in 1988 under the then Labour Party government, and has continued through the nineties under the present National Party (or conservative) government. It has led to a significant reduction in New Zealand's public debt, and to improvements in our nation's balance of payments. The new funding arrangements for N Z universities as well as a period of unrelenting growth at our own University have led to a major change in the administration of our university.

The University of Waikato currently has seven Schools of Study, each led by a Dean, and seven operating divisions, under Directors, of which Facilities Management is one, and each of these units operates as an independent cost centre. Schools are regarded as the primary income source because they generate the EFTS. Divisions are funded by levies on each School according to the use the School makes of the Division. This method of financing the university's operations led to a number of tensions and difficulties, one of which was the provision of accommodation, or space.

Prior to 1990, every significant building in New Zealand universities had been funded by the Government, but only after extraordinary battles for funds. Since 1990, each university has been responsible for financing its own capital works programme. Being the newest university in New Zealand and with no endowments, or wealthy alumni to turn to, Waikato found itself in this new economic Thatcherite, or Reaganite world poorly provided with space as compared with all other New Zealand universities.

The University was also rapidly increasing its enrollments. It had grown from 3,000 EFTS in 1986 to 9,000 EFTS by 1994 while available floor space had not increased commensurately.

Our Space Committee, of which Alan Neilson is the chairperson, was finding itself bombarded with requests for increments of space which could not be met other than at the expense of other Schools or Divisions.

II. Options For Allocating And Funding Space

With devolution to cost centres, there was a need to develop a method of generating a central pool of funds to finance capital works programmes (including funding interest charges and capital repayments of monies previously borrowed to finance earlier capital works projects) and pay for insurance and refurbishing of buildings.

Management Forum (the Deans and Directors) had initially adopted charges to Schools based primarily on EFTS. It was quickly evident, after one year's application, that the system had serious shortcomings. In particular, these were that some Schools which were relatively deprived of space were subsidising others and that space was effectively a "free good" to Schools because acquiring additional space did not directly cost anything, if that School's EFTS did not change.

This latter point also meant that a School's optimal behaviour towards space was contrary to the optimal behaviour of the University as a whole. In particular, while it was in the best interests of each School to try and acquire as much space as possible relative to other Schools, the best interests of the University were to minimise provision of space in order to free up resources for expenditure on all other items. Additionally, Schools' attitudes to acquiring space had

changed to one of being more demanding in their space needs as part of the competitive environment that applied vis-a-vis other Schools and universities.

An analysis of space availability using the norms developed for tertiary institutions by both the British UGC and the Council of Ontario Universities showed that the University of Waikato had less space than suggested by either norm. This was another reason why there were continual requests for more space by Schools and Divisions and thus compounded the problem of there being no financial incentives to economise on available space.

In addition, the Ministry of Education in New Zealand now requires tertiary institutions' accounting records to be such that the true costs of providing programmes of study could be identified.

Although the University of Waikato's annual financial reports had consistently been judged one of the best two from tertiary institutions in New Zealand, its method of accounting for the costs of space including new capital works was such that it could not fully identify the costs of providing various programmes of study.

Thus there was a need to develop a new method of charging Schools for all building related costs, both from the perspectives of efficiency and consistency of objectives by parts of the institution and the whole and also because of a Government requirement.

The University has a number of commercial leases of off campus premises. A major lease for the entrepreneurial Language Institute which attracts full fee paying foreign students for English language courses was being negotiated at the time the University was addressing the problems of rationing and possibly charging for on campus space. This raised the obvious question of why couldn't the concepts of a standard commercial leasing document which have the following characteristics be adapted to a university campus?

- (a) Tenants pay rent which reimburses the owner for the investment.
- (b) The rent received either pays the mortgage, is used to finance further buildings, or whatever.
- (c) The University has capital invested in buildings, and needs more buildings. One department using premises, deprives another of those same premises.
- (d) Old buildings attract a lesser rent than new. Air-conditioned high tech buildings are more valuable than simple buildings.
- (e) Tenants in town pay the cost of "operating expenses" for the costs of servicing shared facilities like the elevators, toilets and foyers.

The Space Committee shied away from the full introduction of a standard New Zealand commercial leasing document because of its complexity and because it didn't meet all of the University's needs, but was attracted to the concept in principle.

III. The Model

The model developed is commonly referred to as a rental model within the University and whilst it has many features of renting commercial property, it also has some significant differences.

In this section of the paper, the similarities and differences to a rental contract and the principles used to develop the model will become apparent.

The key features that needed to be taken into account in developing the model were:

- (i) The need to be fair with charges to Schools and Divisions.
- (ii) Deciding what space to charge for and the need to take into account the different relationships between space occupied exclusively by Schools, space occupied exclusively by Divisions and space shared between Schools and/or Divisions (primarily teaching space and circulation space).
- (iii) The need to provide Schools and Divisions with incentives to economise on space.
- (iv) The need for some flexibility in the level of charges as the scope of the capital works programme varied but at the same time, avoid significant fluctuations in charges from year to year.
- (v) The need to have capital works decisions integrated with the rest of the major decision making of the University rather than being the result of having a fixed amount available from rental charges irrespective of the need for capital works.

The first decision that was needed was a fair basis on which to levy charges. The two main options were the floor area occupied in square metres and the indemnity value of the space occupied. The indemnity value was favoured for a number of reasons, the main ones being:

- (a) It reflected the opportunity cost of the space.
- (b) The indemnity values of buildings were used for insurance purposes and were assessed independently every two years.
- (c) It gave higher values per square metre to newer buildings. This reduces the incentive for requesting a move from an older building to a newer building whereas charges based on floor area would have the opposite effect.

The second decision needed was what space to charge for. It was decided to net out circulation space (stairways, corridors, toilets etc) on the basis that it was communal space that everyone needed to use and that no School or Division had any exclusive claim over such space. This left three distinct categories of space for which charges needed to be levied and then apportioned back to Schools. These areas are School exclusive space, Division-exclusive space and teaching space. (All teaching rooms except specialised laboratories are in a communal pool at the University of Waikato and thus classes from any School can be scheduled in any teaching room at any time).

Charging for School-exclusive space was straightforward using the relative value of space occupied by each School.

Charging Divisions for Division-exclusive space was straightforward using the same principle. Apportioning the charges to Schools was more difficult. The approach adopted was to use proxies for each Division where the proxies were intended to represent the relative amount of work in each Division that was generated by each School e.g. number of books and serials issued by the Library, number of payments made for each School by the Financial Services Division etc. The underlying assumption is that the amount of work generated in a Division by a School determines the amount of space needed by a Division.

Charging for teaching space was more complex.

At the University of Waikato, classes are taught between 8 a.m. and 9 p.m. Monday to Friday. In addition, there are a few weekend classes and a small but growing number of Summer School classes. The number of teaching rooms needed is determined by the peak level demands on that teaching space while at other times there is excess capacity. Thirty four hours between 9 a.m. to 5 p.m. Monday to Thursday and 9 a.m. to 1 p.m. on Friday were identified as prime times

for teaching when there was greatest demand on timetabled teaching space. It was decided to levy charges for teaching space solely on this prime time demand. The major reason for this was that increases in prime time demand would increase the quantity of teaching space required whereas the financial incentive of teaching space being free outside prime time should encourage greater use of non-prime time for teaching and thus reduce the need to build more teaching rooms.

Because Schools have no influence over how often a teaching room is used during prime time, it was considered unfair to determine rental charges for each individual teaching room based on the frequency of use of that room. Instead, what was calculated was each School's relative use of all teaching space during prime time and thus the School's share of the total charges for teaching space was determined.

The methods of charging so far outlined provide clear incentives for Schools particularly and also to Divisions to economise on space. The more space that a School uses exclusively, the more demands that a School makes on a Division and the more use that a School makes of prime time teaching space, the higher will be the School's rental charges. The more space Divisions occupy, the higher will be the costs of operating the Division and thus the higher their charge out rates for providing services to Schools. Thus, the more the Divisional Directors have to justify this budget to Deans and also, where there is a commercial alternative, the more they have to ensure that their charges are competitive with private enterprise.

Another major decision required was the level of charges to implement. As indicated earlier in the paper, it was decided not to use the standard commercial approach of a fixed annual rental. This left two main options:

- (a) the opportunity cost of capital
- (b) the rate needed to finance the next year's capital works and maintenance programmes plus insurance of buildings

The opportunity cost of capital would be the interest rate the University has to pay for borrowing to finance capital works projects. Interest rates in New Zealand fluctuate considerably as a result of the non-interventionist economic environment. To adopt such an approach would mean considerable fluctuations in annual rental charges and these fluctuations would substantially be unrelated to the University's need for capital works programmes.

By relating the charges to the cost of the University's capital works, maintenance and insurance, it is also effectively linked to the University's entire budget. This means that the decisions about new academic developments in particular but also, decisions about growth in existing academic programmes will need to be more closely integrated with decisions about capital works programmes rather than funding new developments and growth without directly considering the costs of providing space and facilities for the developments and growth. In effect each Dean and Director will have to consider the financial implications in two ways. Firstly, expenditure on new capital works will directly reduce their operating budget for that year and thus limit their ability to fund new developments and growth. Secondly, the ongoing rental cost of new facilities will need to be taken into account when considering the viability of these developments in future years. In other words, the method of assessing the viability of new developments and growth from the perspectives of Schools and Divisions will need to be more comprehensive in that there is now a directly related rental charge for capital works.

In this way, the capital works programme will be more fully integrated into the University's decision making process in future years.

IV. The Effect on the University:

The rental model is not fully implemented yet, but it has already led to a number of benefits. The level of awareness about space as a key resource has risen sharply, as has the awareness of the need to integrate space requirements and developments more closely with plans for academic developments.

Deans are now much more inclined to moderate requests for extra space from their departmental chairpersons. They can see that extra accommodation has a direct and significant cost against their budget. They consider carefully the consequences of bids for accommodation in the few new buildings we are able to plan and build, because there is a long term commitment to meeting the cost of that new space.

A most satisfactory feature is that we have already been able to close 8 smaller teaching rooms out of a total of 130 teaching rooms and assign them to other purposes. We are proceeding cautiously in this, but expect to be able to close and reassign several more rooms at the end of this semester, without cutting off our options.

A visible effect of charging for teaching space is the improved utilisation of car parks, because teaching is spread longer through the working day and week with more 8 a.m. classes, evening classes and weekend classes.

The methodology has not created a bureaucracy of its own to operate it. It requires two simple spreadsheet programmes, one relating the areas occupied by the seven schools and seven divisions to the indemnity insurance values of the buildings, the other derived from the teaching timetable. Each produce a calculation of charges for each School and Division. The equations for these calculations are shown in Appendix I.

Appendix 1

Total Charges :

$$C = rV \Rightarrow r = \frac{C}{V}$$

where

C = the expected cost for the year for capital works, insurance and maintenance

V = the total indemnity value of space excluding circulation space = $V_S + V_D + V_T$, the value of School-exclusive space, Division-exclusive space and Teaching space respectively

r = the rate (% of value of space) that needs to be charged to provide C for expenditure on capital works, insurance and maintenance

Charges to Individual Schools :

(a) The charge to School i for School-exclusive space is rV_{Si}

where

V_{Si} = the indemnity value of School i 's exclusive space

(b) For Division-exclusive space :

The charge to Division j for Division-exclusive space is rV_{Dj}

where

V_{Dj} = the indemnity value of Division j 's exclusive space

The charge to School i for Division j 's exclusive space is $rw_{ij}V_{Dj}$

where

w_{ij} = the share of Division j 's total costs paid by School i

The charge to School i for the costs of all Divisions' space is $r \sum_{j=1}^n w_{ij} V_{Dj}$

where

n = the number of Divisions

(c) The charge to School i for teaching space is

$$\frac{r V_T \sum_{k=1}^p f_{ik} V_{Tk}}{\sum_{i=1}^m \sum_{k=1}^p f_{ik} V_{Tk}}$$

where :

V_{Tk} = the indemnity value of teaching room k

f_{ik} = the frequency that School i uses teaching room k during prime time

m = the number of Schools

p = the number of teaching rooms

(d) The charge to School i for all space paid for by School i is thus

$$r \left[V_{Si} + \sum_{j=1}^n w_{ij} V_{Dj} + \frac{V_T \sum_{k=1}^p f_{ik} V_{Tk}}{\sum_{i=1}^m \sum_{k=1}^p f_{ik} V_{Tk}} \right]$$

Strategic Planning As A Tool For Improved Facilities Management

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Background

Like many public universities, the University of New Mexico has grown rapidly during the past four decades, with burgeoning enrollment and a proliferation of new programs and new facilities. Those increases in space were not matched by increases in budgets and staff to maintain them. By the beginning of the '90s, reduced support for the University's physical plant and basic infrastructure was clearly visible. The deferred maintenance backlog had increased dramatically. Major equipment and systems were deteriorating: university vehicles averaging over 15 years of age and replacement parts were difficult to find for some repairs; the useful life of boilers and chillers had long since past. All utility distribution systems were beyond their useful lives and were experiencing high failure rates and outages. There were little or no reserves for replacement.

During the preceding decade, increasing demands from regulatory agencies, the use of increasingly complex and toxic chemicals, and the need for greater technology and skills to address complex environmental issues put added pressure on a physical plant resources that were already heavily burdened with deferred maintenance and many years of no growth in supply budgets. Facilities were deteriorating and landscape planting investments were being neglected and were deteriorating and diseased. An obvious result: low morale of staff, a lack of recognition or appreciation of the skills and compensation levels required, inadequate training, inadequate-to-poor space for facilities management personnel, and very few opportunities for professional development and advancement.

In 1992, under the leadership of a new president, a new Vice President for Business and Finance, and a new Physical Plant Director, the needs of the physical plant were identified as an urgent priority. The University had recently completed a strategic plan - UNM 2000; it was decided that the Physical Plant Department would have one as well. According to the charge prepared by Vice President David Mc Kinney, the goal of the plan would be to "Target the year

2000 as the date when we would have our physical facilities in a positive state of repair, support, and a departmental operation that is responsive, efficient, and effective in providing quality physical facilities to support the institution's mission." An integral part of the planning process was to include evaluation of the organizational and financial structures.

Developing The Plan

What began in the summer of 1992 was a uniquely designed planning process, which involved participation of more than 200 individuals over a period of only 6 months. While the final document outlining the Department's new vision, mission, goals and recommended strategies was not published until the fall of 1993, implementation steps had already been taken as a result of the process. The formal plan document served as a comprehensive report on proposed new directions and the process for determining them. Its most important value, however, was found in a process which created a newly shared vision of the Department's potential future, and the willingness and motivation to change the organization from one characterized as being starved of funds, support, and recognition to one that plays an essential role in the critical academic and institutional mission of the University.

What was so unique about this process, and why was it successful?

All the classic elements of strategic planning were inherent in this process and are not very unique. The process produced a new vision statement and a revised mission statement for the Department of Physical Plant. It identified goals and objectives, and recommended a set of strategies to meet those goals and objectives. The important self-evaluation or assessment factors were included as well as a review and discussion of external trends, threats, and opportunities facing the University and the Department. A comprehensive analysis of internal strengths and weaknesses was also done.

There were three key elements about this process that were unique.

1. Broad participation and commitment to the process, including internal stakeholders as well as external advisors and consultants.
2. Development of performance criteria for change; and
3. Concurrent development of a new management plan reflecting recommended implementation strategies.

The commitment of Physical Plant management to an open, collaborative process, coupled with the support of University administration, academic units, and other departments, assured that no-one would be left out of an opportunity for input regarding the department's future. Identifying measures of success, or key performance indicators (KPI's), was an important technique for building a bridge between frequently abstract or conceptual thinking and tactical or operational planning. The development of implementation plans demonstrated the commitment of management both at a University-wide as well as department-level to a recognition that change would only occur if the plan produced a direct impact on the allocation of resources, management, staffing, organization, and facilities. Without this reality, it was determined that the planning process would be perceived as only an exercise.

Participatory Planning

A real challenge in developing a participatory planning process relates to how people are encouraged to participate meaningfully and productively when they represent such diversity in education, background, many different levels, from a wide variety of departments and functional areas. The more open the process, the more complicated it becomes. Meetings can become unwieldy either because of the numbers of people involved and the difficulty of arranging for a commitment to attendance, or just the sheer difficulty of focusing a group with such a wide range of skills and specific interests on a set of strategic issues. For example, middle-level and upper-level managers are more likely to be comfortable discussing TQM, policies, management structures, budgeting, etc. It is highly unusual for electricians, plumbers, irrigation specialists, secretaries and accounting staff to be invited to participate in such discussions and planning sessions.

This process began with a 2-1/2-day planning retreat off campus which involved 38 people. Participants invited to this initial planning session included representatives from departments other than Physical Plant (eg; Human Resources, Material Management, Facilities Planning, as well as academic schools and colleges). The group included labor and management staff who represented all of the various functional units within the Physical Plant department. Vice President Mc Kinney was a key participant as well.

In addition, a critical decision was made to involve outside expertise both to facilitate the planning process and to offer advice and counsel as the planning proceeded. A private consultant was retained to facilitate workshops, meetings, and task groups, and to draft summary notes and planning documents. Four directors of physical plant departments in other similar universities And Wayne Leroy, then Associate Vice President of APPA, were invited to the initial planning retreat and consulted regularly throughout the process. The guest directors were able to provide valuable input on their own experiences with similar issues, differences in planning among institutions, and an assessment of the external environment for planning. Another key strength which the guest directors brought to the process was their individual abilities to leverage and extend the thinking of the larger group to far beyond the parochial limits of the campus. This synergy was a very important part of building the momentum that would be required to carry the project through. And it was this cross pollination of ideas that helped to create a shared vision of the possible.

The comments and observations of the guest directors were supplemented by several videotapes which addressed issues and concepts of concern to this planning process. All of the sessions, including two planning retreats and all of the workshop sessions, were videotaped as well. The tapes were made available to a wide group of people who were not able to attend meetings, but could schedule time to view the taped sessions.

A series of focus groups and workshops were established to discuss key strategic issues developed during the planning retreat discussions. The entire Physical Plant Department staff, numbering about 550 people, were invited to participate in one or more of these; and again, representatives from other University departments were invited as well. Nearly 200 people participated in these focus groups, in which the majority of goals, objectives and strategies were more fully developed. These meetings were usually 90 minutes to two hours in length and took place over a period of three months.

And, to make sure that each Physical Plant staff member was given an additional opportunity for participation, the Director attended staff meetings with each sub-unit of the department to discuss the overall planning process, to invite participation and to ask for ideas and comments, and to answer questions.

The workshops, departmental-level meetings, and focus groups resulted in a set of draft reports which were presented at a second day-long planning retreat. The discussion there provided the framework for the first draft strategic planning document which was, in turn, distributed for comment across the campus, and, in its final form, presented to the President and the Board of Regents.

Performance Criteria For Change

The second key element of the planning process was the identification of key performance indicators (KPI's), or quantifiable measures of success. For example, a goal of the strategic plan for facilities management is to improve the condition of the physical plant. What measurable performance indicators could be identified to define achievement of success in improving the condition of buildings and/or grounds? Examples might include:

- Size of Deferred Maintenance Backlog
- Cost of Maintenance per square foot
- Number of work orders in specific categories
- Frequency of emergency calls

A reduction in the size of the deferred maintenance backlog, or a reduced cost of maintenance per square foot would be measurable indicators of successful achievement of the goal of improving the condition of facilities. And, specific targets, such as a 50% reduction in deferred maintenance, could be established as objectives, not just performance indicators. Measurable objectives such as these can be used to establish and/or monitor budgets performance, staffing levels, and other control devices.

Participants in the planning sessions were asked to identify KPI's for the entire range of activities, services, and/or products of the Physical Plant Department, and these were weighted by the group according to their priority or level of importance. Several dozen KPI's were suggested, and many of these were variations of the same. The individual KPI's were then analyzed and sorted according to common similarities. The sorting process resulted in the following six categories:

- Condition of Facilities and Grounds
- Cost and Availability of Utilities
- Regulatory Compliance
- Cost and Value of Products and Services
- Productivity
- Customer Service

These categories, and all of the KPI's within them, became the basic theme on which task groups were formed. Each of the six task groups was asked to re-evaluate the KPI's and the relevant issues, and develop specific goals and objectives related to each of the six areas. Very early

in the process of forming task groups, it was determined that two additional task groups were needed to cover issues that were not included in any of the six primary topic areas previously assigned: **Management Information Systems**, and **Purchasing and Warehousing**. These particular areas required a considerable amount of data gathering and special expertise, neither of which were on hand. A purchasing and warehousing consultant was engaged and other qualified staff were assigned to conduct the necessary research, interviews, and analysis, and prepare appropriate recommendations for these focus areas. The Management Information Systems specialist also floated among all the other focus groups giving and taking input on MIS systems and needs as they related to the issues being discussed in the other focus groups.

All of the rest of the task groups were asked to choose a chairperson, or task group coordinator, whose job it was to schedule meetings, facilitate discussions, and prepare summary notes of their deliberations. These notes were then forwarded to the strategic planning consultant, who synthesized and organized the notes into a consistent format and re-distributed them back to the groups for additional editing and/or discussion. The final products of the six groups were incorporated into the draft strategic plan for the entire department.

Linking The Plan To Management

The third, and perhaps most critical, element in the planning process was the development of a new management plan. While the conceptual side of strategic planning can challenge thinking and motivate cooperation toward a shared vision and shared goals, the development of implementation plans can be quite threatening, and trust was a key requirement. At this point, organization charts were developed, roles and responsibilities re-defined, resources allocated or re-allocated, and new priorities established. New organizational relationships developed. There were winners and losers, and difficult choices to be made. This was a very creative period, and we were beginning to think seriously about what we were doing and how we were doing it.

While the six task groups and the two additional teams studying MIS and Warehousing/Purchasing issues were working, a separate management team began work on a concomitant management plan that would be totally consistent with the goals, objectives and strategies which were beginning to clearly emerge from the bottom-up process that had been already well established.

Key features of the management plan included a flattening of the organization, creating new positions through planned attrition and retirements, and finding ways to convert space that no one wanted into attractive facilities that would properly and motivate staff. A major commitment was made to zone management - decentralizing facilities management to bring frontline staff closer to the customer interface. An investigation was launched to find model MIS applications that could be readily converted to UNM needs and a funding plan was prepared to identify the scope of the deferred maintenance in the utilities production and distribution infrastructure. The first ever Utilities Master Plan was launched to identify and prioritize badly needed infrastructure projects. These various initiatives were discussed with University administration and internal staff and revised as the strategic plan itself was coming together.

By the winter of 1993, the strategic plan and its management plan were ready for full publication and dissemination. A new series of meetings was initiated with various campus groups and key administrators. These included the President's Council, the Council of Deans, the UNM Board of Regents and, particularly, its Facilities and Finance Committee, Directors of Business

and Finance, the chairs of the academic departments in Arts and Sciences, and others. In addition to the group meetings, personal follow-up sessions were scheduled with many of them. This process consumed much of 1993, but during this time the implementation planning had already begun. By the end of 1993, the formal planning documents were published, but the plan had already moved into its action-oriented phase.

Results

By the first quarter of 1995, more than 15 months following publication of the plan, what can we say the plan accomplished?

- The management structure of the Physical Plant Department was re-organized.
- New roles and responsibilities were identified and implemented for every division.
- A comprehensive master plan for Utilities was completed.
- A new Management Information System was acquired, tested, and is operational in several specific areas with much more to come.
- The new Zone Management System was implemented.
- Much of the aging fleet of vehicles has been replaced with fewer and smaller utility vehicles to reinforce the commitment to zone deployment.
- A number of major capital projects have been initiated, especially the securing of funds of Phase I of a new 22MW electrical substation.
- A new Customer Service Task Force has been implemented.
- Regular newsletters are published and distributed to the entire campus leadership (soon to be on a monthly basis).
- New space has been provided for three of the four zones, including remodelling of significant portions of the Physical Plant main building for more effective utilization of the 1945 vintage building.
- New programs for staff development and training have been initiated, space has been provided which is utilized by other university departments, and attendance has been enthusiastic.
- All staff are being equipped with all required safety apparel.
- Uniforms and ID's expected in the new fiscal year.
- Currently underway is the review of all jobs, job descriptions and designing of career paths.
- The Physical Plant is a recognized campus leader in the Customer Service management planning activities of the larger campus.
- All of this has been accomplished without a single layoff or a single grievance!

The success of this process is based entirely on the commitment to a "buy-in" from the vast majority of involved staff and stakeholders. Everyone involved was able to connect to the new vision because they felt that management was really listening. There has been literally no negative fallout from the changes that have been made, though most of them are enormously significant. The leaders of the task groups were not experienced in group facilitation or their coordinating

role, yet took that role very seriously. Every individual on staff was empowered with his or her role in the change process. The credibility of the process itself proved to be its most important outcome.

What is resulting from this collaborative effort is a shared vision of a place in which we'd all like to work and make our contributions.

Vision

By the year 2000, the Physical Plant Department will excel as stewards of the University's physical resources by:

- Developing and strengthening our skills and abilities, and renewing our resolve to account for their effective utilization;
- Assuming a leadership role in the responsible use of resources through establishment of meaningful criteria and measurable performance standards for the activities for which we are responsible;
- Assuring that new construction and support systems are reliable, easily maintained, have standardized components, and facilitate energy conservation; and at the same time, consistent with the architectural environment and pedestrian scale that help define the unique character of the University of New Mexico;
- Demonstrating Statewide leadership in energy and other conservation practices;
- Developing a work force that clearly understands its role in the University, takes ownership of the quality of its products and services, and is responsive to the challenges and changing needs of the campus community;
- Delivering high quality customer service by performing efficiently and effectively, focusing attention on those activities we do well, and demanding continuous improvement of our processes, procedures and methods;
- Protecting the University's employees, customers and guests through enhanced safety education, elimination of work place hazards, and achieving full compliance with all regulatory requirements;
- Developing a climate of accountability and trust - that is enabling and challenging - that fosters risk taking, innovation and creativity - that seeks out forward-looking solutions using state-of-the-art technologies, organizational and management practices;
- Developing an organizational culture that rewards effective communication, teamwork, and cooperation, and encourages broad participation and recognition of accomplishments; and
- Developing a work place that is free of fear, intimidation and hassle...one where all participants can be winners and can freely celebrate "the winning".

Reengineering Caretaking At The University Of Toronto

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With 52,000 students, the University of Toronto, St. George Campus carries on a scale of operations second to none in Canada. Ongoing University budget reductions require all departments to justify their budget allotments in the face of administrative scrutiny. The University's Facilities and Services department, during the past four years, has been successfully accomplishing a cultural revolution with the most significant changes occurring within the largest division, Caretaking Services. Having a strong union in place, the employees of Caretaking Services were accustomed to operating within a complacent environment, free of threat of competition. Given widespread customer dissatisfaction, high employee absenteeism, little or no emphasis on customer service, and virtually no communication with users, a transformation was needed. Through ambitious leadership and employee empowerment Caretaking Services was reengineered. The division's human and physical resources were restructured, staff development and training was initiated, budget and staff reduction targets were met, a satisfied customer base was established, supportive computer software was purchased and communication among all levels of the organization was achieved.

Embarking On Reengineering

In 1990, the Assistant Vice-President, Operations and Services, at the University of Toronto, launched a strategic plan to reform physical plant operations with a series of intensive planning sessions with the directors of the Physical Plant Department. As an initial step, to better reflect its identity, the name Facilities and Services was adopted. Facilities & Services then embarked on an ambitious Service Excellent Program called "Campus Care", initially employing the services of a management consultant to assist in orchestrating this cultural change. Realizing that reengineering of Facilities & Services would be a multi-tiered task, the first phase of changes was initiated in the largest division, with the highest profile, Caretaking Services.

The starting point in reengineering Caretaking Services was to build the division's image and establish customer satisfaction. The goals of Caretaking Services were simple to define: to improve customer service and employee productivity, establish divisional credibility within the community, achieve maximum service levels with increasingly reduced budgets while maintaining employee confidence, and strengthen staff through communication training. Working closely with the Director of Buildings and Grounds and the Manager of Caretaking Services, the Assis-

tant Vice-President endorsed a facilitative and participative leadership model to achieve Caretaking Services' objectives. This model involved a number of initiatives to be undertaken concurrently, each of which will be described in depth as follows. The key was to reengineer the organization from the bottom-up, with management listening to both the customers and 330 workers.

In order to ensure customer input throughout the process, focus groups were established, made up of Facilities and Services representatives and customer groups within the various buildings on campus. These focus groups provided a forum for discussions on the expected levels and quality of cleaning services as well as other property management issues. The focus groups continue to meet on a regular basis to ensure a high level of customer satisfaction is maintained.

Fostering A Cultural Change

One of the thrusts of the Campus Care program was to open communications between employees and their managers. Training sessions were launched for all managers and supervisors to introduce them to the facilitative and participative management methods of improved communications and leadership skills for conducting effective meetings. For many it was the first opportunity to become acquainted with peers on a personal level, and to approach commonly recognized problems as a group.

All managers and supervisors were then asked to meet with their staff on a monthly basis, with a support coach to help them through the first few meetings. Employees were allowed to bring up any issues they wished to discuss, minutes and action items were recorded on special forms and copied to the next level of management. Issues not resolved at the meetings were answered by the next level of management. It took a while for everyone to become accustomed to this open level of communication. The meetings produced good and bad criticism of the operations of the Caretaking Department. In the past mistrust had existed between front line staff and management. This program improved communication and trust since all staff from front line up realized that they could have a say on any issue.

The Director of Buildings & Grounds initiated and continues to conduct quarterly sessions with all front line and supervisory staff. The sessions focus on clarifying program elements, soliciting employee feedback on program strengths and weaknesses, and motivating employees to continued involvement. The meetings provided the opportunity for open discussion with the employees on the details of Facilities & Services and Caretaking Services budget cuts.

In addition to opening communication levels, it was also recognized that ongoing education would be beneficial to all staff in assisting them in the cultural change.

Managerial Development Training Programs

With the assistance of the University's Human Resources Department, staff development and training programs were developed in-house to ensure that the programs met the Department's needs. Managers and supervisors received training in effective team leadership, facilitative leadership, career development, computer software applications and supervising in a unionized environment. The University of Toronto Labour Relations Department has adopted the training program, "Supervising in a Unionized Environment", designed and written for the Caretaking Department, for use among its 14 other campus union groups.

Customer Service Training For All Front Line Staff

Communication skills training was given to all front line caretaking staff. By building communication skills, the aim of Caretaking Services was to deliver quality service with a caring attitude. It was a personal enhancement course offering the opportunity to discuss techniques for dealing positively with customers, co-workers, supervisors and family. The content of the training sessions included: negative communications, positive communications, barriers to effective communications, body language, telephone skills, listening skills, customer needs and how to handle difficult situations and customers. Other subjects discussed were: common problems between employees and their supervisors and what can be done to remedy them, techniques for dealing with stress, and what can the university do to help employees perform their jobs.

English As A Second Language Program

Toronto has a multi-cultural population and English is a second language for many of the caretakers. This joint union management program is a good example of how co-operation between labour and management can benefit everyone. Employees attend four hours a week of class time, two hours of university time and two hours of their own time. The Toronto Metro Labour Education Centre runs the program using campus facilities. A major benefit is that employees can better understand product labels and comply with the work place hazardous materials information system regulations of the Ontario Health and Safety Act. Employees who found that their lack of English skills was an impediment to job advancement have attended the classes and subsequently been successful in their application for promotion. The success of this program has been outstanding, with an average of 70 staff members enrolled per year since the program commenced four years ago.

Developing A New Organization Structure

Through the Focus Group meetings with customers and other Facilities & Services representatives, it became obvious that the existing organizational structure was very inefficient, cumbersome and not customer focused.

The existing system consisted of three shift operations: day evening and night, covering the total campus, with a Shift Manager in charge of each shift, creating a overlap of responsibility for each building. This had generated a lack of problem ownership. There was customer dissatisfaction and frustration at not being able to contact or obtain feedback from shift managers responsible for the evening or night shift. There was confusion between shifts as to who was responsible for what services. The result was each shift ran as a separate entity which fostered an atmosphere of mistrust and lack of responsibility. Coordination of the shift management was also a problem, as the three Shift Managers and the Manager, Caretaking Services, were rarely on campus at the same time.

Task Group To Develop Organization Structure

An internal task group within Caretaking consisting of the Director, Manager and Shift Managers was initiated to brainstorm and consider all the information obtained from the cus-

former focus groups, with the basic philosophy of providing the customer with a single source service and information contact.

Task Group Proposal

1. Divide the campus into three geographical areas: North, Central and South.
2. Appoint an Area Manager to be responsible for all caretaking services, performed in all buildings on all shifts in each geographical area.
3. The Supervisor should be resident in large buildings with 20 or more staff.
4. Benchmarking with other Universities highlighted the fact the employee to supervisor ratio was too high. Recommended that the ratio be reduced from 36:1 to 25:1. With a front line staff complement of 315, 4 additional supervisory positions would be required, increasing the existing 9 positions to 13.

Benefits To The University Community And The Department

1. Building occupants would have a single contact person, the Area Manager, who would be responsible for all caretaking services performed on all shifts in their buildings.
2. Area Managers would make themselves available for approximately four hours a day during regular daytime hours to interface with Building Occupants.
3. Area Managers would be responsible for a smaller, more manageable geographical area of the campus.
4. Caretaking front-line staff in each building would now report through their Supervisor to one Area Manager resulting in much less conflict between shifts, eliminating the "it's not my job" syndrome and transferring responsibilities to the other Shift Managers.
5. Reduction of the staff to Supervisor ratio would give Supervisors more time to do quality control inspections, supervise and train staff and not spend most of their time running from building to building just to make sure all areas were cleaned.
6. The Manager would be able to meet more often on a regular basis with the three Area Managers as a group during the day time.
7. Locating Resident Supervisors in large buildings would put them much closer to customers and staff and allow them to react more quickly to problems.

The Task Group's proposals were presented to representatives of the caretaking supervisors and staff, senior Facilities and Services management and selected customers for their comments. All recommendations were accepted, with the increase in the number of new supervisors held until the new organizational structure was in place.

Establishing Credibility Within The Community While Coping With Budget And Service Reductions

Computer Workload Program

In the midst of these departmental changes, a series of short and long term budget cuts were imposed. With 330 employees working in 115 buildings, cleaning more than 8.7 million square feet, this budget task presented a major challenge for the management of the department. It became very apparent that coping with these budget reductions in a rational way would be next to impossible without a computerized workloading program. A software program was required to do the "what if scenarios" such as: what effect would cleaning offices twice a week instead of daily have on the labour requirements for the campus. From benchmarking with other Canadian Universities who had a computerized workloading program, it was determined that Huntington's Engineered Management System should be purchased. Since only two months were available to put the system into operation, Huntington was contracted to download the University's space inventory data base and complete two sample buildings totalling approximately 1 million square feet. Without this assistance, it would have taken at least six months to gain effective system expertise. Using the system, it was established that by reducing the frequency of cleaning in non-public areas, primarily offices, across campus from daily to twice per week, a reduction of 50 employees would be possible. Also, very importantly, the system confirmed that the labour in public areas was justified.

Labour Savings Due To Transfer Of Night Shift To Days

To reduce labour cost further, the possibility of transferring the night shift to the day shift was investigated. If feasible, this would eliminate a 55¢ per hour shift premium for 110 night shift employees. The night staff were consulted, with the vast majority in favour of the change. A two year plan was then developed to transfer the night caretaking shift to days in conjunction with service level and staff reductions in the 20 buildings being cleaned on the night shift.

Implementation Of Shift And Service Level Changes

Before implementing any changes focus group meetings were held with building customers to highlight the impending changes. It was essential to win their confidence before implementing the changes. Computer print outs of the existing and proposed service level changes were handed out at the focus group meetings and thoroughly discussed. The outcome was an agreement with minor changes.

With the staff, similar meetings took place to discuss shift, service level and frequency changes, highlighting the need to clean a larger area less frequently. In other words, work smarter not harder. Agreement was again reached with a few minor changes, for instance the morning starting times were adjusted to match public transit schedules. In buildings being cleaned on the day shift, heavily used areas by students such as cafeterias, auditoriums, lecture theatre, classrooms, seminar and reading areas were cleaned between 6:30 a.m. and 9:00 a.m. Other public areas such as entrances, lobbies, corridors, elevators, lounges, washrooms and stair-

wells were cleaned mid morning between 9:00 a.m. and 11:00 a.m. All other areas such as offices, laboratories, computer rooms, carrels, locker and storage rooms, etc., were cleaned between 11:00 a.m. and 3:00 p.m. The refinishing of floors, including stripping, was solved in the following manner: in non-public areas a convenient time was arranged with the occupants or the room booked for the time required; public areas were done during slow periods such as reading week, Christmas and spring breaks and during the summer vacation period. If more time was needed a crew was transferred to the evening or night shift temporarily until the work was completed. The number of "wet floor" signs was increased and carpet sweepers used in some areas. In a few buildings, including all libraries, where noise levels had to be kept to a minimum, quiet canister type vacuum cleaners were used, with noise levels of less than 50 decibels.

The two year program to eliminate the night shift has now been completed. Increased productivity, a safer work environment and improved customer and staff communications has been our experience to date.

Customer Feedback Forms

A crucial measure of the effectiveness and accountability of the program is customer feedback. In all buildings where changes have been instituted feedback forms are sent to academic and administrative customers six months after the agreed changes have been put into effect. The return rate has been in the area of 65%, with more positive than negative comments. All negative comments are investigated and service adjustments made where possible.

(See Feedback Form, Appendix "A")

Increased Automation To Compensate For Staff Reductions

The switch to day cleaning in many of the large buildings could not have worked without the purchase of at least two large autoscrubbers for each building. These are used to wash the lobby and corridor floors during the daytime. Over the past few years, using the labour savings, new equipment has been purchased, with the involvement of the front line staff in its selection.

Quantitative Chemical Use

The quality and number of chemicals used across campus were also investigated. The procedure had been for Purchasing to tender all chemical needs and then buy the lowest cost product. The result was poor product performance, overuse of many chemicals and unsatisfactory looking hard floor surfaces. The following steps were taken to improve the situation. An in-house testing program of chemicals was done concentrating mainly on floor finishes. After selecting the floor finish which gave the best combination of performance and cost, neutral detergent, stripper and germicidal were purchased from the same supplier. This meant the chemicals were compatible and allowed the supplier to provide a lower cost on the whole package. By using this procedure, the number of suppliers has been reduced to three and the number of chemicals to less than ten. Staff complaints regarding the quality of the products now being used have dropped and costs have not risen. The major supplier is also now able to assist in training the front line staff in proper use of the products. The overall appearance, especially the hard floors, has improved significantly across campus.

Develop A Cost Effective Attendance Monitoring System

All Facilities & Services Management and Supervisory Staff received training on how to incorporate the T.Q.M. process in solving problems within their departments. Caretaking picked high absenteeism amongst front line staff as the most significant issue requiring resolution. The Employee Absenteeism T.Q.M. team consisted of 7 Caretaking Management and Supervisory staff, 1 Administrative Staff member and an outside Consultant to act as a facilitator. The team's mission was to determine why there was excessive use of the sick leave plan by caretaking employees. The objective was to find a way to reduce employee absenteeism to the same level as other universities. The team met 18 times over a five month period before tabling their recommendations. The root causes of the problem were identified as follows:

1. The generosity of the plan which pays employees up to 75 days for each illness.
2. Low employee morale as most employees know that some co-workers are abusing the plan and little was being done about it by management. Employees resent covering for those who are absent.
3. Employees take revenge against management as they know if they are absent this causes the Supervisor problems in terms of coverage.
4. Disciplinary process is ineffective in that if Management suspects abuse, it can not question the reasons for an employee's absence if they have a valid doctor's certificate.

The combined root causes created a culture in Caretaking that resulted in the university having a 33% higher absenteeism rate than the four other large Ontario Universities with similar sick leave plans. On average each caretaking employee at U of T was taking 18 1/2 paid sick days per year versus an average of 14 paid sick days for the other four Ontario Universities. Other interesting data collected by the T.Q.M. team showed that 33% of the employees are absent for more than 15 days a year, that age did not reveal a pattern even though the average age of the staff was just over 50 years and the day shift had higher rates of absenteeism than either the evening or night shift. The one major difference between the other universities and the University of Toronto was the ratio of front line staff to Supervisors: 20:1 at four other universities versus 36:1 at U of T. The conclusion reached by the team was that Supervisors did not have time to monitor absenteeism properly and the employees thus felt they were untouchable. The T.Q.M. team recommendations were as follows:

1. Develop an attendance monitoring system to track and control absenteeism that could eventually be computerized;
2. If the attendance monitoring system after being in effect for at least two years did not lower the rate of absenteeism, the sick leave plan be changed to pay out only 75% of the employees normal wages per day which would have the immediate effect of lowering sick leave costs by 25%. Alternatively, changing to an earned system where the employees earned so many days per year up to a maximum should be investigated.

The attendance monitoring system was developed by the team and put into action 2 1/2 years ago. There was an initial 2% reduction in the absenteeism rate. Refinements to the program are ongoing. This attendance monitoring system is now the model being recommended by Labour Relations for all university departments dealing with unionized staff.

(See Attendance Monitoring, Appendix "B")

Private Sector Monitoring

As anyone who is involved in the management of an in-house caretaking operation knows, there is usually constant back-ground noise which asks, why are we in-house?, wouldn't contracting out make for a more efficient and cost effective caretaking operation? Sometimes these questions come directly from senior management. To investigate the perception many people held that a private sector contractor could run a more efficient operation, Modern Building Cleaning, Canada's largest private sector contractor, was asked to do a complete review of the management and supervision of Caretaking operations. After six weeks involving six senior personnel including the President, Modern came up with the following observations:

1. All of the Modern personnel who participated in the study of Caretaking Services at U of T were impressed with the service levels currently delivered under existing conditions.
2. Considering the high rate of absenteeism due to illness, vacation, etc., the levels of productivity appear to be quite good in most buildings.
3. The Area Managers and their Supervisors are convinced they do not have adequate time to provide the on-site supervision necessary to achieve an improved quality standard.
4. The incidence of absenteeism is excessive when compared to other universities sites, and unheard of in contract cleaning generally, even in unionized accounts.

All of Modern's recommendations related to the role of the Supervisor except one, which addressed the problem of absenteeism. They confirmed that the internal recommendations were valid: the number of Supervisors be increased, Resident Supervisors be introduced in the largest buildings, non-resident Supervisors geographical areas be realigned to make them more compact, and an attendance monitoring system be instituted. In addition they recommended that the Supervisors' job description be revised to give them more authority, Supervisors should start and end their shifts on-site, Supervisors should begin quality assurance inspections immediately, more Supervisor training in employee management should be provided, and a trainer be appointed for the EMS3 computerized Quality Assurance Program purchased from Huntington. Modern's observations and recommendations were good news as they supported the contention that Caretaking was running an efficient and effective operation and were justified in increasing the number of Supervisors from 9 to 13. Upon receipt of Senior Management approval, the recommendations were implemented within a few months, with the shift premium savings covering the cost of four additional Supervisors.

Manual And Computerized Quality Assurance Programs

At the time of the re-organization, there was no formal quality assurance program. With the reduction of the front line staff to supervisory ratio to a more manageable level, Supervisors now had time to spend at least one hour a day doing quality assurance inspections. This meant that each employee's area would be inspected once a month. Supervisors were trained in the use of Huntington's EMS3 Quality Assurance Software Program. This program downloads data from a PC to a hand held trakker. The trakker is like a large hand held calculator that prompts the Supervisor to inspect and rate the downloaded items. The rated items are then uploaded to the PC to obtain computerized reports and graphs. This system has proven to be a very effective tool in monitoring the standard of cleaning and employee performance.

Benchmarking With Other Canadian And American Universities

Benchmarking allowed the University of Toronto to make comparisons with other universities across Canada and in the northern United States. The type of information gathered was as follows: the total square footage of buildings on campus; the number of full time equivalents (FTE'S) employed in the Caretaking Department and their average hourly wage rate; the number of full time Supervisors; the number of full time Managers; the number of FTE'S per shift; planned shift changes if any; the frequency of service in offices and public areas, possible service level or frequency reductions in offices or public areas; and the effect of early retirement plans if any.

After collecting the above information from each university surveyed, comparisons were made as to the average square footage cleaned per FTE, square foot costs for wages and the average number of FTE'S supervised by each Supervisor.

Benchmarking showed that productivity at the University of Toronto was very much in line with other universities considering the level of service supplied to our customers.

(See Benchmarking, Appendix "C")

Conclusions

The productivity gains from the agreed upon levels of service, new equipment, reorganized shifts, quality inspections and reduced absenteeism have enabled Caretaking Services to reduce staff by 50 or 15% and attain a \$1.6 million budget reduction.

The innovative management initiative undertaken at the University has widespread applicability in public and private institutions of higher education. Organizations with a large unionized custodial staff, high employee absenteeism, poor communication habits, and alienation between customer and service providers, would stand to benefit from an examination of the management initiatives we launched concurrently at the University of Toronto.

Although few universities are as large or perhaps as complex as the University of Toronto, the conditions under which we must operate are similar to those for many educational institutions in Canada and the United States. Combined with budgetary restraints, is a closer scrutiny of universities by the public, private sector and government for accountability in the responsible use of resources. A management initiative that combines budget reductions with improved customer satisfaction, and enhances the life skills and morale of employees while keeping labour relations amicable meets such expectations.

Caretaking Services' success can be measured through the increasingly positive survey test results, to a point where customer concerns are minimal. As well there is the encouraging reduction of employee absenteeism, employee commitment to training and career development and the endorsement from other departments through their adoption of many of the division's program elements. What makes the accomplishment noteworthy is the sheer size and age of the Institution within which the many complex program elements were implemented over a relatively short period of time. A task comparable to turning a large ocean liner 180 degrees.

The key component of Caretaking Service's success is the realization that front-line employees would make the difference. It was understood that re-aligning the division was not a top-down operation. Satisfying the customer had to be done ultimately by an interested, capable

work force. By listening, correcting mistakes and quickly implementing change, Caretaking Services continues on the path of continuous change.

FACILITIES & SERVICES - CARETAKING DIVISION CUSTOMER FEEDBACK FORM

TO: _____

DATE: _____

On _____, 1994 in the _____ building the Caretaking night shift was changed to days and the frequency of cleaning in non-public areas of the building was reduced. We at Caretaking Services are very interested in your comments and suggestions with regards to these changes. Please take a few minutes to fill out this form and return it to the Manager, Caretaking Services, through the campus mail in the enclosed self-addressed envelope.

1. Has the switch to day cleaning caused any inconvenience to the following users of the building?

- A) Students
B) Academic Staff
C) Administrative Staff

Yes		No	
Yes		No	
Yes		No	

If you answered yes to any of the above please explain.

2. Have you found that the communications between your department and Caretaking has improved since day cleaning was implemented?

Yes		No	
-----	--	----	--

3. In non-public areas of the building i.e. offices, labs, etc. where the frequency of cleaning and garbage removal has been reduced from daily to twice a week, has this caused any problems?

Yes		No	
-----	--	----	--

4. Do you think the frequency of cleaning in these areas could be further reduced without causing undue hardship?

Yes		No	
-----	--	----	--

5. In areas with special circumstances, were we able to make adjustments to the schedule or frequency of cleaning to satisfy your requirements?

Yes		No	
-----	--	----	--

6. During the past six (6) months would you say the overall appearance and cleanliness of the building has:

Decreased	
Stayed the same	
Improved	

7. Have you found the Caretaking staff to be friendly and courteous?

Yes		No		Have no contact	
-----	--	----	--	-----------------	--

8. Additional comments, concerns or suggestions.

ATTENDANCE MONITORING SYSTEM

* * * *

**OBJECTIVE OF
ATTENDANCE MONITORING
SYSTEM**

- **CONSISTENCY BY ALL MANAGERS/SUPERVISORS**
- **TRACKING DEVICE/STATISTICS, including:
What treatment was offered, etc.**
- **SHOWS THAT UNIVERSITY IMPLEMENTED ITS
BEST ATTEMPTS AT OFFERING THE
EMPLOYEE HELP, AS REQUIRED.**

* * * *

UP TO 3 DAYS ABSENT:

University sick plan provides enough of a deterrent for one/two day absences:

- 5th instance - lose 1 day pay
- 6th instance - lose 2 days pay
- 7th instance - lose 3 days pay

Employee Must:

Phone in the first day sick

Supervisor Must:

Use telephone interview Form "A"

Phone employee on the third day:

- ASK: - What's wrong
- Need Doctor's certificate

Bring Doctor's certificate to the office

SUPERVISOR'S REPORT OF EMPLOYEE'S ABSENTEEISM

SECTION #1 - To be completed when employee's absence totals three consecutive working days.

SECTION #2 - To be completed when employee has returned to work.

SECTION #1

Employee' Name:

Classification:

Building Name:

Contact was by: Telephone / Visit

DATE:

TIME:

INITIAL DATE OF ABSENCE:

Reason for absence: (ie. - nature of medical problem)

Date of anticipated return to work:

Did you instruct employee of the necessity of providing a medical certificate

YES / NO

REMARKS:

Prepared by Supervisor:

Date:

SECTION #2

DATE RETURNED TO WORK:
(attach medical certificate)

SUPERVISOR'S SIGNATURE: _____

3 - 15 DAYS ABSENT (One-time absence or collective number of absences)

SUPERVISOR INTERVIEW:

Face-to-face, in building for each absence

USE FORM "B"

Copy of this form goes to the Area Manager and to the Employee's file (Both in Caretaking Office and Central Employee File)

ATTENDANCE DISCUSSION

Employee absent more than 2 days but less than 15 days this year.

DATE: _____

EMPLOYEE: _____

SUPERVISOR: _____

- 1) Meet one on one with employee. Point out the fact that you have noticed they have been absent lately.
- 2) Ask if there are any unusual circumstances and can you or the University help?

NO: _____

YES: _____

YES - HOW? _____

- 3) Remind them attendance is important as it creates problems for fellow workers, the U of T community and you. Also mention that you hope they can improve. Keep it short and to the point. Then monitor the results.

Supervisor's signature

c.c. Area Manager
Employee's file

FILE: S-DIS1

15 + DAYS ABSENT

AREA MANAGER INTERVIEW:

- Pull file with previous two years absence record.
- Determine if chronic absence behaviour pattern developing, or not.
- State that attendance will be reviewed in 6 months or sooner if there are further absences of up to 10 additional days.

USE FORM "C" Questions 1, 2, 3 & 8

If chronic absence behaviour pattern is developing, at the discretion of the Area Manager, questions 4, 5, 6 & 7 may be asked.

FOLLOW-UP:

If no chronic absence behaviour pattern found:

NO WRITTEN FOLLOW-UP

If chronic absence behaviour pattern found:

USE FIRST FORM LETTER:

("...may affect employment with University").

ATTENDANCE DISCUSSION

FORM "C"

Employee absent 15 days or more

DATE: _____

EMPLOYEE: _____

MANAGER: _____

- 1) Tell employee that the reason for this interview is they've been absent 15 days or more this year (July to June), and it is the department's policy to review this with the employee.

- 2) Ask if there are special or unusual reasons for their rate of absenteeism?

NO: _____ YES: _____

YES - reason (s) given: _____

- 3) Is there any way you or the University can help?

NO: _____ YES: _____

YES - HOW? _____

QUESTION #4, #5, #6 & #7 ARE ASKED AT THE DISCRETION OF THE AREA MANAGER OR MANAGER.

- 4) Tell employee that they had been absent on _____ occasions for a total of _____ days. This record causes problems for fellow employees, the U of T community and you!

.../2

- 5) Tell employee this is a serious matter and failure to improve could result in further management action.

Will they make a commitment to improve?

YES: _____

NO: _____

- 6) Advise that they may/will be required to provide a medical certificate as per Article (21:07) of the Collective Agreement for all future claims for sick leave and that a letter covering this meeting will be sent to them, the Union and placed on their file within one working day.

YES: _____

NO: _____

- 7) Ask it either has any questions.

Employee: _____

Steward: _____

- 8) Shake hands tell employee, you look forward to seeing an improvement and to feel free to speak with you, if they have any problems.

AREA MANAGER OR
MANAGER'S SIGNATURE

c.c. Employee's file

File: S-DIS2

FIRST LETTER

Date: _____

Name:

Class:

Caretaking Services

Dear _____:

A review of your attendance record for the past two years has revealed an alarming amount of lost time due to sickness or injury. It is now to a point where it must be addressed.

Your lost time due to sickness or injury is as follows:

YEAR	# OF WORKING DAYS	# OF INCIDENTS OF SICKNESS OR INJURY	# OF SICK DAYS	# OF DAYS W.C.B.	% OF WORKING DAYS ABSENT

You are presently not fulfilling your obligations to the job at the university, therefore unless there is immediate improvement, we may have no recourse but to take further action. We will continue to monitor your attendance record closely in the future.

Please be advised that you may be required to provide a medical certificate for all absences taken regardless of the length of absence.

If there is any way the university can assist you or if there are special or unusual reasons for your above noted rate of absenteeism please feel free to contact me to discuss this matter further.

Area Manager
Caretaking Services

c.c. Manager, Caretaking Services
CUPE 3261
Labour Relations
Employee's file

File: S-for1

SUBSEQUENT SUPERVISOR TRACKING:

15 + DAYS AND UP TO 10 ADDITIONAL DAYS: (One-time absence or Collective number of Absences)

Employee Must:

Phone in the first day sick

Supervisor Must:

Use existing telephone interview form "A":

- Phone employee on the third day:

ASK: - What's wrong
- Need Doctor's certificate

Bring Doctor's certificate to the office

SUPERVISOR INTERVIEW:

Face-to-face, in building for each absence.

USE FORM "B"

Copy of this form goes to the Area Manager and to the Employee's file
(Both in Caretaking Office and Central Employee File)

SUBSEQUENT AREA MANAGER TRACKING

25 DAYS AND OVER

- If determined absence behaviour is not chronic Area Manager may conduct interview

MANAGER'S INTERVIEW:

- Pull file with previous two years absence record.
- Determine if chronic absence behaviour pattern developing, or not.
- State that attendance will be reviewed in 6 months or sooner if there are further absences of up to 10 additional days.

USE FORM "C": Questions 1, 2, 3 & 8

If chronic absence behaviour pattern is developing, at the discretion of the Manager, questions 4, 5, 6 & 7 may be asked.

FOLLOW-UP

If no chronic absence behaviour pattern found:

NO WRITTEN FOLLOW-UP

If chronic absence behaviour pattern found:

USE FIRST FORM LETTER: ("...may affect employment with University").

If first form letter has been issued previously and chronic absence behaviour pattern continues:

USE SECOND FORM LETTER: ("...will affect employment with University").

SECOND LETTER

Date:

Name:

Class:

Caretaking Services

Dear _____:

A further review of your attendance records has shown that there has been no significant improvement in the amount of lost time due to sickness or injury since the first attendance review letter was issued on _____.

Your lost time due to sickness or injury is as follows:

YEAR	# OF WORKING DAYS	# OF INCIDENTS OF SICKNESS OR INJURY	# OF SICK DAYS	# OF DAYS W.C.B.	% OF WORKING DAYS ABSENT

The university regards absenteeism as a very serious matter as it creates problems for fellow workers and the U of T community. A failure to make immediate improvements regarding your attendance will result in the university having no recourse but to take severe action which may lead to termination.

Manager
Caretaking Services

Attachment of first letter

C.C. _____, Area Manager
CUPE 3261
Labour Relations
Employee's file

File: S-for2

UNIVERSITY OF TORONTO - CARETAKING COMPARISONS MARCH 1994

QUESTIONS	U. OF T.	ALBERTA	U.B.C.	QUEENS	YORK	WESTERN	MCMASTER
Total Campus Square Footage	8,700,000	7,700,000	6,500,000	2,800,000	3,900,00	3,900,000	3,100,000
Number of Caretaking Staff	274	282	225	123	140	136	101
Square Footage per Employee	31,800	27,300	28,900	22,800	27,900	28,700	30,700
Number of Full Time Supervisors	012	012	012	006	006	007	005
Number of Employees per Supervisor	023	024	019	021	023	019	020
Number of Managers	004	002	005	001	002	001	002
Average # of Days Absent	6.0%	6.0%	5.0%	6.0%	6.0%	5.0%	5.2%
Number of Staff per Shift							
Days	140	045	160	089	015	045	095
Evenings	126	121	030	022	010	091	002
Nights	008	116	035	012	115	000	004
Planned Shift Changes	Eliminate Night Shift	Move evening Shift to Night	Eliminate Evening Shift	None	10 FTE's from Night to Evening	None	None
Level of Service							
Offices	Twice a week	Once a week	Twice a week	Every other day	Daily	Once a week	Every other day
Public Areas	Daily	Daily	Daily	Daily	Daily	Daily or every other day	Daily
Possible Service Level Reduction							
Offices	Once a week	Unknown	Once a week	Every 3rd day	Every 2nd day	Unknown	None
Public Areas	None	None	None	None	None	None	None
Effect of Early Retirement Plans	None	New Plan coming	None	None	None	None	None

UNIVERSITY OF TORONTO - CARETAKING COMPARISONS - MARCH 1994

QUESTIONS	GUELPH	NOTRE DAME	ILLINOIS STATE	OHIO STATE	PURDUE	PENN STATE	MICH STATE
Total Campus Square Footage	4,100,000	4,500,000	2,500,000	5,300,000	8,500,000	9,500,000	11,000,000
Number of Caretaking Staff	137	240	092	190	272	248	255
Square Footage per Employee	30,000	18,800	27,200	28,000	31,300	38,300	43,100
Number of Full Time Supervisors	006.5	013	006	016	014	011	006
Number of Employees per Supervisor	021	018	015	012	019	023	043
Number of Managers	002.8	002	003	002	001	002	004
Average # of Days Absent	5.9%	5.5%	15.0%	6.0%	4.0%	*2.4%	5.0%
Number of Staff per Shift							
Days	035	120	005	091	039	090	006
Evenings	002	070	069	067	142	110	190
Nights	100	050	018	032	091	048	059
Planned Shift Changes	More day Shift	Move evening Shift to Night	None	None	None	None	None
Level of Service							
Offices	Daily	Daily	Once a week	Daily	Daily	Once a week	** Once a month
Public Areas	Daily	Twice daily to daily	Daily	Daily	Daily	Daily to twice a week	Daily
Possible Service Level Reduction							
89 Offices	None	None	None	None	Unknown	Unknown	None
Public Areas	None	None	None	None	None	None	None
Effect of Early Retirement Plans	Coming	None	None	None	None	Minimal	None

* Earned plan to maximum 12 days per year. ** Academics trying to have funding and service restored.

UNIVERSITY OF TORONTO - CARETAKING COMPARISONS - MARCH 1994 (Canadian Universities) - GUELPH

QUESTIONS	U of T	ALBERTA	U.B.C.	QUEENS	YORK	WESTERN	MCMASTER
Total Campus Square Footage	8,700,000	7,700,000	6,500,000	2,800,000	3,900,000	3,900,000	3,100,000
Number of Caretaking Staff	274	282	225	123	140	136	101
Square Footage per Employee	31,800	27,300	28,900	22,800	27,900	28,700	30,700
Average Wage Rate per hour	13.50	10.50	14.50	15.25	14.75	13.90	13.91
Direct Wage Cost per year	7,693,920	6,158,880	6,786,000	3,901,560	4,295,200	3,932,032	2,922,213
Direct Wage Cost per sq. ft. per year	88.4 ¢	80.0 ¢	104.4 ¢	139.3 ¢	110.1 ¢	100.8 ¢	94.3 ¢

UNIVERSITY OF TORONTO - CARETAKING COMPARISONS - MARCH 1994 (American Universities) + GUELPH

QUESTIONS	GUELPH	NOTRE DAME	ILLINOIS STATE	OHIO STATE	PURDUE	PENN STATE	MICH STATE
Total Campus Square Footage	4,100,000	4,500,000	2,500,000	5,300,000	8,500,000	9,500,000	11,000,000
Number of Caretaking Staff	137	240	092	190	272	248	255
Square Footage per Employee	30,000	18,800	27,200	28,000	31,300	38,300	43,100
Average Wage Rate per hour	14.01	* 8.50	10.25	9.00	* 8.00	10.70	12.10
Direct Wage Cost per year	3,992,454	4,243,200	1,961,440	3,556,800	4,526,080	5,516,488	6,417,840
Direct Wage Cost per sq. ft. per year	97.0 ¢	94.3 ¢	78.5 ¢	67.1 ¢	53.2 ¢	58.1 ¢	58.3 ¢

Wage Costs do not include fringe costs

American Wage Rates and Costs are in U.S. Dollars

* Non-Union

Preserving "In-House" Physical Plants

James O. Roberts

*Director Of Facilities Management
Georgetown College
Georgetown, Kentucky*

Preface

As you are aware, more and more institutions are attempting to save money, streamline, and improve facilities departments through contracting or privatizing their operations. This was the case at Georgetown College. We believed we were providing a quality service for a reasonable cost and were meeting the needs of the institution. Out of the blue, at a meeting of mid-managers and supervisors, it was announced the college intended to search for contractors to provide maintenance, housekeeping, book store and food services.

With the threat of replacement and our desire to remain as an in-house program, we began working to put together information that would show what we provide and exactly what other schools have experienced with contract management. For the most part, the information I will provide relates to small schools, our enrollment is approximately 1200 FTE. All the information provided is available to anyone who wishes to contact me. We were successful in fending off the challenge, this time. Believe me, it can happen to anyone, even you.

Where We Were

In 1992 a new president was appointed at Georgetown College. As is always the case, with new management comes a new philosophy and change. We began his tenure with enthusiasm and excitement. The time was right for improvements and a new structure of administration. This lasted for a full year. At that time budget reality began to set in and a tightening of belts was on the horizon.

Our budgets, as many of yours are, are very tight. We make up six percent (6%) of the total institutional budget (See attached Exhibit I). The Facilities Management department at Georgetown includes housekeeping, maintenance, campus safety, rental property, vending services, and capital projects. We have significant deferred maintenance and a small endowment.

The college determined the best way to reduce the overall college budget was to reduce the overall number of personnel on campus. The downsizing, as it was called, took effect in 1992. Ten percent (10%) of the facility staff was released. At the same time, no faculty were reduced.

Food service experienced a fifteen percent (15%) reduction in staffing and the overall campus, excluding faculty, was reduced by a significant amount.

The retirements of many individuals reduced the need for large layoffs. In a way, this was more acceptable than actually releasing working individuals. The next step to be taken was the reduction of budgets to bring us "in-line" with funding sources. Reductions in the Facilities Management department ranged from none in some line items, to as much as 50% in others. We accepted the new budget figures and continued to provide as much service as possible.

What Can Happen

At some point in time our president traveled to a meeting with other college presidents. During this meeting, one of the major topics was contracting campus services. Individuals from a major food service and hotel contracting company, who will remain nameless, took our president out to play golf. Not once, but twice. During these outings, they found out about the size of the campus, where we were located, how many students we had, and built a scenario for the president about what they could provide.

After his arrival back on campus, "the visit" took place. At this time he was told they could save him \$200,000 in maintenance costs. With the budget cuts, and layoffs, this was information that could not be passed up. Within a week, a meeting was called to meet the president. This is not unusual. There are open lines of communication and we often meet to ask questions and share information on happenings around campus. The news was stunning when the topic was brought up of contracting for services. We were told what the savings would be and the terms would be negotiable. Most people would be able to keep their jobs initially and the contractor would have the option as time goes by to continue their employment.

The directors of each department asked for a meeting with the president. On January 3, 1993 this meeting took place. The explanations for contracting are common:

- We were downsizing, and the president cannot fulfill his fiduciary responsibility without looking at all areas.
- This should be a learning process, we must look at all options.
- This is not to hurt people or let anyone go.
- There is no real desire to go contract, it is purely a financial consideration. * We must look to operate more effectively, same services for less cost.
- This is not a short term answer, it must be a long term gain for the institution.
- We are acting more business like and this is a change in philosophy.

At this time we felt the only option we had was to develop a clearer understanding, in the president's mind, exactly what we do and how that relates to the money he has been told can be saved. After several hours of discussions, we were asked to prepare some specific information. By January 15, we had to have the facts to justify what we were doing. We were to solicit job specifications and be prepared to review proposals. This was our last chance. It was our only opportunity to show what we were doing and how we compare to other schools. Where is our competition? What is our status on campus? How are we perceived by our customers?

Information

- Where do I go for help?
- Who do we call?
- What information will help?
- How do I start?

My first call was to APPA. I needed a book on contracting and I remembered seeing something in a brochure. They sent me *Contract Management or Self-Operation A Decision-Making Guide for Higher Education*. This was sponsored by the Council of Higher Education Management Associations. This document lists 10 phases for a decision making process. Within these I knew who the key participants were at this point. (The president, my boss, and the management of the operations being affected) Using what we had, very little, we were developing a framework to provide information to help the president make a decision. Steps three through eight were the important information where we could make a difference. "Assess the current environment, identify customer requirements, review legal, ethical and community considerations, develop operational design, identify operating alternatives, compare and contrast proposed alternatives." (See attached exhibit II)

If you have not been surveying your customers, I recommend you immediately begin. Louis Morrell, Vice President and Treasurer at Rollins College in Winter Park, Florida, put it this way in the September 1994 APPA newsletter. "The old attitudes of "no one listens to me" and "the workers don't know anything" should be overcome. At the same time, those served should be consulted. Few directors of facilities ever ask faculty, administrators, or even students what the physical plant department could do to improve service to them." For the last five years, we have been surveying our customers. Resident directors, faculty, staff, departments, students, etc. (See attached Exhibit III) We ask about the quality of the work done by our staff. We ask if the work was done in the time frame they felt was appropriate. We ask about the attitude of the staff. We ask about the expertise exhibited by the staff. We ask if we were effective if solving their problem. We ask how we compare to other staffs where they have been and we ask for any comments they might wish to share. We ask that we be rated on a scale of 1 to 5 with 1 being excellent and 5 needing improvement. Since we had a good background of information to work with, we did another survey to see where we stood at that point in time. The Office of Institutional Planning accumulated and tabulated the results. We rated above average in all areas with attitude of staff, quality of service and effectiveness of response being the highest. This helped us to know that our direction was appropriate. We were doing the right things. The president qualified our service as excellent.

We believed the next most important thing for us to do was to compare ourselves to our competition. We made a list of all Baptist schools in the nation. We made a list of all the Carnegie Liberal Arts I institutions within 250 miles. Finally, we added all private schools similar in size within 250 miles. This totaled nearly 100 institutions (See attached Exhibit IV). We used a phone interview and contacted the physical plant. If they were not available, we talked to the business office. Our final report included 87 responses. The Vice President for Administration and Finance sent out a letter to many of the same institutions and received another 12 responses from Vice Presidents.

During our interview we began by asking, Do you contract maintenance? The next question was, Do you contract housekeeping? If yes to either of the above, we asked with whom? We then asked how long have they contracted? The next question we believed was very important to us, what is the manager's tenure? If they did not contract we asked how long the director had been in place? And finally, what comments do you have about contracting or not contracting?

The purpose of this information was to see where we stood in the overall facilities arena. We found 28% (25/87) contracted housekeeping and 20% (18/87) contracted maintenance. The average length of time contracting had taken place was slightly more than four (4) years. The average length of tenure for managers of contracted services was two (2) years. 14% (9/62) of the schools had contracted at one time but no longer contracted. The average tenure for directors that were non contract was over seven (7) years. The most common comment regarding contracting was the number of managers during the length of the contract. Hampden Sydney had three (3) managers in two (2) years, The University of Mobile had five (5) managers in seven (7) years, Grand Canyon University had three (3) managers in five (5) years, Mars Hill College had four (4) managers in two (2) years, and Kentucky Wesleyan had seven (7) managers in three (3) years.

The final bit of information we believed was necessary was a comparison with other schools to determine where we stood financially against comparative institutions (See attached Exhibit V). There is a wonderful document published by APPA called "The Comparative Costs and Staffing Report" If you have not taken the time to fill out the information to be included in this document, shame on you!!!! I keep this close at hand and use it regularly. From this information we were able to compare ourselves to institutions within our region that are the same size and truly are "apples to apples".

You must know what your institution is striving to become. In our case, we were looking to be Carnegie Liberal Arts 1. We looked at the facility costs and staffing per square foot (See attached Exhibit VI). This cost includes the total cost of labor benefits, supplies, contractors, tools and equipment for maintenance, housekeeping, and facilities administration. We have almost 630,000 square feet and spend \$1.53 per square foot for the above listed areas. Many of the colleges we compared ourselves to, spend more than \$2.50 per square foot and some as much as \$5.00. Truthfully, there are many factors that influence this information, unions, the type of building, the expectations of the administration, the location of the facilities. This comparative information is not in any way intended to say that "more is wasteful or bad". It just says we spend less. That is all. (I found out later that the contracting company thought they could do our campus for under \$2.75 a square foot. Wow, me too!?)

We compared our utility costs believing this was another sign of responsibility from within our department. We also know that we live in a wonderful part of the country where the electrical costs for bulk, 7200 volts of power is less than \$.04 per KW. We purchase our gas on the spot market, (thank you Dorsey Jacobs), but we have a city owned water and sewer supplier that cost us between \$7 and \$8 per 1000 gallons. We did well! (See attached Exhibit VII) Our total cost is \$.76 per square foot for the above listed utilities. We were again near the bottom in cost. In no instance, did I find any contract service that was responsible for increases in utilities after they take over. Ask the question, what part of your budget are your utility costs, and who is now going to be responsible for it?

Presentation

Now that we had these four major pieces of information, we had to present them to the president in a format that would be read, understood, and passed along. So as not to look like the information was made up, we listed all the schools and made headings to cover each question that was asked. We listed the school comparison information in a chart format and on the reverse side we used a graph format. As is always important, the most important information was highlighted, circled, or noted at the bottom of the page. We always listed the source of the information.

The executive summary concept is always appropriate at our institution. The vice presidents are interested in the overview without all the background information, but the information that develops the summary must be close at hand. For our work, we chose a fold out pamphlet (See attached Exhibit VIII). We used a colored paper and listed each of the major topic areas as bullets. The topic was underlined and the related information was offset to help it stand out. On the back we listed the resources and other issues that were not included.

The other issues were items we found while doing our research. The list included:

- You can contract performance but not responsibility.
- How does contracting relate to our mission and guiding principles?
- Has progress on our Great Performance Objectives (This is our business plan) been unsatisfactory?
- Internal expertise is lost when removing long term employees.
- Contractors often encourage management incentives based on short term financial goals at the possible expense of the campus.
- Contract prices will rise.
- Do contractors treat employees fair and ethically as the college does now?
- The cost of contracting is directly related to their responsiveness and services.
- Contract administration is time consuming.
- Every un-contracted request results in a negotiation.
- Current vendor contracts may be jeopardized.
- Current management has shown fiscal responsibility.
- Responsibilities of Facilities Management not included in maintenance and housekeeping are: construction management, project specifications, natural gas purchase, vending services, laundry services, rental property management, summer programs, facilities scheduling and farm contracting.

We worked very hard to compare apples to apples. We looked at schools that serve the same students, we looked at schools that were close in size to ours. We looked at the same programs to calculate costs. We called schools that were mentioned by the president. We talked to individuals in the same departments. We went to business officers to get a related view. We were asked to specifically provide information on both sides.

To provide information from both sides of the fence is difficult. We developed what we felt were the nine (9) most common reasons given for contracting services. We did not list them by priority. They are:

- Volume Purchasing
- Management Time
- Operational Headaches
- Standardized Procedures
- Controlled Costs
- Income Stream
- Labor/Benefit costs
- Professional Management
- Capital Upgrades

It was to our advantage to be able to show evidence of each area listed and explain what we had done in each area to be efficient, effective, and provide return for the college. Several examples of this are purchases for construction projects that reduce tax dollars. Develop relationships with vendors that are alumni and or major donors to the institution. Our operation allows flexibility and responsiveness. We have excellent response to crisis. Major power failures, floods, and snow storms, are examples of times when work goes well beyond the normal contractual agreement. We were able to show how rental income has increased steadily as well as vending and laundry incomes increasing steadily the annual projection five (5) years in a row. The college has made a commitment to upgrading the investment in capital over the last three (3) years. The money given to the institution for inventory and equipment by a contractor is a short term cash advance and would not provide for long term funding of operations. This was a major selling point for our situation.

All contractors will put in bold letters how well trained their staff is and how experienced they are. They will emphasize the structure behind the manager that your institution will not have. The experience we have comes from APPA, their support and printed material including the network of more than 2000 members nationwide was another important factor.

Life After The Siege

When our Board of Trustees met in January of 1993, the issue of contracting was on the agenda for the Business Affairs committee. None of the managers of the departments being scrutinized were allowed to be included in the meeting. I don't know why I wasn't included. Maybe it was because I yelled and screamed at earlier meetings, throwing chairs (although not as far as Bobby Knight) discussing individuals heritage, etc. Any way, there was a unanimous vote NOT TO CONTRACT. This was a resounding cry of support for our departments.

We learned a great deal in preparing for this decisive vote. We verified in document form what we believed to be the case:

- We provide the service our customers want.
- We compared ourselves to schools we compete with.
- We provide quality products at fair prices.
- We must continue to be flexible to change.

It is impossible to emphasize enough how important it is to communicate with all around you. Survey all the individuals you work for and with. Ask what you can do better. Find out

where you stand. Develop an instrument to look at what you need to be doing. Keep records and adapt to the changing needs of the community. There will be times when the administration will not listen to what you have accomplished. These are the best times to polish up your resume.

Continue to develop your relationship with your senior administrators. Make sure they are keenly aware what your department does (See attached Exhibit IX). Routinely show your boss what you do financially to save the school money and to make the school money. Let them know where you stand in relationship to your aspirant institutions. Go the extra mile to keep everyone informed.

One final note. There is one item that came up time after time and that is the difference between maintenance and housekeeping at college and universities and that at manufacturing plants. (We just happen to be under the influence of Toyota Motor Manufacturing) OUR STAFF COMES INTO DIRECT CONTACT WITH OUR CUSTOMERS. We continue to be concerned about what type person a vendor or contractor will bring onto our campus. In a christian atmosphere, it is important to continually hire people that understand what we stand for and believe. Look for this type differentiating factor at your institution.

Good Luck!!!!

References

Morrell, Louis R., "Privatization and the Senior Facilities Manager." APPA Newsletter, September 1994, pp. 6-7.

Glazner, Steve, 1991-92 Comparative Costs and Staffing Report, For College and University Facilities, APPA, The Association of Higher Education Facilities Officers, APPA, 1993.

Goldstein, Philip J., Kempner, Daphne E., and Rush, Sean, Contract Management or Self-Operation, A Decision-Making Guide for Higher Education, APPA, The Association of Higher Education Facilities Officers, 1993.

CURRENT FUND UNRESTRICTED BUDGET, FY 94
Georgetown College
(\$,000 Omitted)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Item	Actual 91-92	% of Total	Approved Budget 92-93	% of Total	Proposed Budget 93-94	% of Total
I. Income:						
A. Tuition and Fees	7,792	51.4%	8,407	52.3%	8,860	54.1%
B. Gifts and Grants	1,536	10.1%	1,795	11.2%	1,528	9.3%
C. Endowment Income	635	4.2%	527	3.3%	413	2.5%
D. Other Income	175	1.2%	149	0.9%	163	0.9%
E. E & G Subtotal	10,138	66.9%	10,878	67.6%	10,964	67.0%
F. Auxiliary Enterprises	5,026	33.1%	5,205	32.4%	5,403	33.0%
G. Total Income	15,164	100.0%	16,083	100.0%	16,367	100.0%
II. Expenditures & Transfers:						
A. Instruction	3,760	24.8%	3,974	25.4%	4,054	24.8%
B. Public Service	9	0.1%	10	0.1%	5	0.0%
C. Academic Support	668	4.4%	647	4.1%	708	4.3%
D. Student Services	1,475	9.7%	1,647	10.5%	1,771	10.8%
E. Institutional Support	2,257	14.9%	1,530 *	9.8%	1,632	10.0%
F. Operation/Maintenance	1,016	6.7%	937	6.0%	983	6.0%
G. Scholarships/Grants	1,599	10.5%	1,926	12.3%	2,226	13.6%
H. E & G Subtotal	10,784	71.1%	10,671	68.3%	11,379	69.5%
I. Auxiliaries	4,001	26.4%	4,217	27.0%	4,379	26.8%
J. Mandatory Transfers	72	0.5%	353	2.3%	242	1.5%
K. Non-mandatory Trans.	306	2.0%	386	2.5%	367	2.2%
Total Expenditures	15,163	100.0%	15,627 **	100.0%	16,367	100%
III. Excess Income over Expenditures	1		456		0	

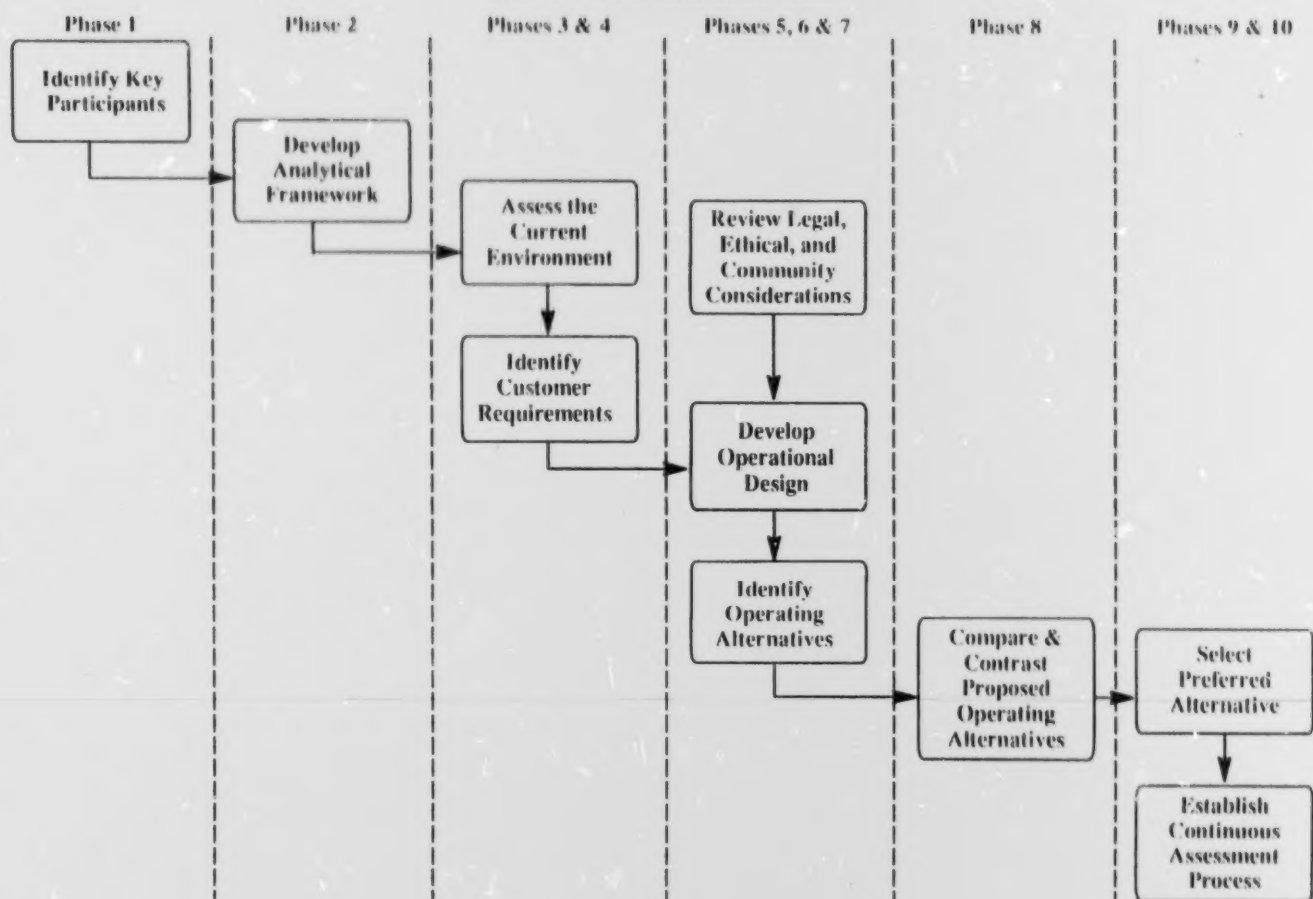
*Development, National Development, Planned Giving, Capital Campaign moved to Foundation

**All equipment purchased moved to plant fund (including books & periodicals)

BEST COPY AVAILABLE

100

Figure 1
Structural Decision Process

*Conceptual Decision Process*

BEST COPY AVAILABLE

GEORGETOWN

C O L L E G E

Facilities Management

FACILITIES MANAGEMENT (Director and Office Staff) Program Evaluation

Please take a minute and think about the services provided by Facilities Management. Respond to the questions below on a scale of 1-5, with 1 being excellent, 3 being average, 5 needing improvement, or don't know by circling the most appropriate response.

Please comment on any question and feel free to be specific. We appreciate your input and hope to use it to improve our service to you. If possible, please return to the Facilities Management Office by January 14, 1994.

1. What is your feeling of the quality of work done by our staff?
1 2 3 4 5 don't know
2. Was the work you required, done in the time frame you felt was appropriate?
1 2 3 4 5 don't know
3. Was the attitude of the staff what you expect from a service organization?
1 2 3 4 5 don't know
4. Did the staff exhibit an expertise in the service they were providing?
1 2 3 4 5 don't know

-OVER-

5. Was the work done effective in assisting you with your problem or providing your service?

1 2 3 4 5 don't know

6. How would you compare our staff with other staffs you have observed (hospitals, schools, institutions, stores, etc.)?

1 2 3 4 5 don't know

COMMENTS: _____

Signature (Optional): _____

GEORGETOWN

C O L L E G E

Facilities Management

MAINTENANCE

Program Evaluation

Please take a minute and think about the services provided by Maintenance. Respond to the questions below on a scale of 1-5, with 1 being excellent, 3 being average, 5 needing improvement, or don't know by circling the most appropriate response.

Please comment on any question and feel free to be specific. We appreciate your input and hope to use it to improve our service to you. If possible, please return to the Facilities Management Office by January 14, 1994.

1. What is your feeling of the quality of work done by our staff?
1 2 3 4 5 don't know
2. Was the work you required, done in the time frame you felt was appropriate?
1 2 3 4 5 don't know
3. Was the attitude of the staff what you expect from a service organization?
1 2 3 4 5 don't know
4. Did the staff exhibit an expertise in the service they were providing?
1 2 3 4 5 don't know
5. Was the work done effective in assisting you with your problem or providing your service?
1 2 3 4 5 don't know

- OVER -

6. Did the staff have the tools and parts to appropriately address your needs?

1 2 3 4 5 don't know

7. How would you compare our staff with other staffs you have observed
(hospitals, schools, institutions, stores, etc.)?

1 2 3 4 5 don't know

COMMENTS: _____

Signature (Optional): _____

STATE	INSTITUTION	CONTRACT		COMPANY NAME	LENGTH (YRS)	MGRS. * TENURE	DIR. ** TENURE	COMMENTS
		HSKP	MATN					
AL	Judson College	N	N				1.5	Contracted 2yrs, poor service. 5mgrs/7yrs
AL	Univ. of Mobile	Y	Y	NMRC	7	2.5		
AL	Samford University	N	N				4	
AZ	Grand Canyon U	Y	Y	S-M	5	1		Will not renew, 3mgr/5yrs.
AR	Ouachita Baptist	N	N				16	
AR	Williams Baptist	N	N				5	
CA	California Baptist	Y	Y	MARR	1	1		Retired, new mgr hired 3mo. Contracted once, dissatisfied.
FL	FL Baptist	N	N				19	
FL	Palm Beach Atlantic	N	N				14	
FL	Stetson College	N	N				6	
GA	Brewton-Parker	N	N				15	
GA	Mercer University	N	N				20	
GA	Shorter College	Y	N	Local				
GA	Truett-McConnell	N	N				21	
IN	DePauw	N	N				7	
IN	Earlham	N	N				31	
IN	Goshen	N	N				5	
IN	Hanover	N	N				7	
IN	Wabash	N	N				21	
KY	Asbury	N	N				18	
KY	Bellarmine	N	N				6	
KY	Berea	N	N				12	
KY	Brescia	N	N				5	
KY	Campbellsville	N	N				20	
KY	Centre	N	N				5	
KY	Clear Creek	N	N				5	

14-Jan-94

* MANAGER OF CONTRACTED SERVICE **DIRECTOR OF COLLEGE RUN FACILITIES DEPARTMENT

STATE	INSTITUTION	CONTRACT		COMPANY	LENGTH	MGRS. *	DIR. **	COMMENTS
		HSKP	MATN	NAME	(YRS)	TENURE	TENURE	
KY	Cumberland	Y	Y	S-M	2	0.5		Poor Management, 7mgrs/3yrs.
KY	Georgetown	N	N				6	
KY	Kentucky Wesleyan	Y	Y	MARR.	3	0.3		
KY	Spaulding	NA						
KY	Thomas More	N	N				4	
KY	Transylvania	N	N				13	
LA	Louisiana College	Y	Y	S-M	6	2		
MS	Blue Mountain	N	N				9	
MS	Mississippi College	N	N				26	Tried Contract, unsuccessful.
MS	William Carey	N	N				10.5	Tried SM with food, dissatisfied.
MO	Hannibal-LaGrange	N	N				15	
MO	Missouri Baptist	NA						
MO	Southwest Baptist	N	N				7.5	
MO	William Jewell	N	N				18	
NC	Campbell	N	N				20	
NC	Chowan College	NA						
NC	Davidson	N	N				4	
NC	Gardner-Webb	Y	Y	S-M	8	8		
NC	Guilford	N	N				6	
NC	Mars Hill	Y	Y	S-M	2	0.6		Mgrs turnover, 4/2yrs.
NC	Meredith	N	N				6	
NC	Salem	Y	Y	S-M	2	2		
NC	Wake Forest	Y	N	S-M	10	2		
NC	Wingate	N	N				9	
OH	Antioch	N	N				3	
OH	Cedarville	N	N				11	

STATE	INSTITUTION	CONTRACT		COMPANY	LENGTH	MGRS. *	DIR. **	COMMENTS
		HSKP	MATN	NAME	(YRS)	TENURE	TENURE	
OH	College of Wooster	NA						
OH	Denison	N	N				27	
OH	Kenyon	N	N				1	
OH	Marietta	N	N				17	Tried contract, no loyalty/control
OH	Mt. Saint Joseph	N	N					
OH	Oberlin	N	N				1	
OH	Ohio Dominican	N	N				4	
OH	Wilberforce	N	N				25	
OH	Wittenberg	Y	N	ISS		9		
OK	Oklahoma Baptist	N	N				10	
SC	Anderson	Y	N	NAT.		2	1	
SC	Charleston Southern	N	N				4	
SC	Furman	N	N				3	
TN	Belmont	N	N				10	
TN	Carson Newman	N	N				20	
TN	David Lipscomb	Y	Y	S-M		5	1	
TN	King	Y	Y	S-M		5		1
TN	Maryville	N	N				6	
TN	Rhodes	N	N				6	
TN	Union	NA						
TN	Univ. of the South	N	N				3	
TX	Baylor	Y		ABM		12		
			Y	WACO		1	1	
TX	Dallas Baptist	N	N				5	Contract 8yrs, very dissatisfied.
TX	East Texas Baptist	N	N				2	Contract ARA, poor job.
TX	Hardin Simmons	N	N				10	

14-Jan-94

* MANAGER OF CONTRACTED SERVICE **DIRECTOR OF COLLEGE RUN FACILITIES DEPARTMENT

STATE	INSTITUTION	CONTRACT		COMPANY NAME	LENGTH (YRS)	MGRS. * TENURE	DIR. ** TENURE	COMMENTS
		HSKP	MATN					
TX	Houston Baptist	Y	Y	ABM	2	2		
TX	Howard Payne	Y	N	ABM	7	3		
TX	Mary Hardin	Y	N	UNIV	10	1		
TX	Wayland	Y	N	VAR.S.	8	3		
VA	Averett	Y	Y	S-M	8	6		
VA	Bluefield	Y	Y	S-M	11	8		
VA	Hampden-Sydney	N	N				5	Replaced SM, 3mgrs/2yrs.
VA	Rollins	N	N				20	
VA	Randolph-Macon	N	N				6	
VA	R/M Women's College	Y	Y	S-M	3	1.5		
VA	Sweet Briar	Y	Y	S-M	8	8		
VA	Richmond	N	N				2	
VA	Virginia Intermont	Y	Y	S-M	10	2		
VA	VMJ	N	N				10	
VA	Washington & Lee	N	N				30	
87 RESPONSES								
<u>TOTALS</u>		25	18	<u>AVERAGE YEARS</u>		<u>AVERAGE</u>		9 SCHOOLS CONTRACTED,
		28%	20%	4.74		2.05	7.02	NO LONGER CONTRACT.

SCHOOL COMPARISON OF FACILITY COSTS AND STAFFING PER SQUARE FOOT

SCHOOL			SCHOOL SIZE	COST/SQ. FT. *
FURMAN UNIVERSITY, SC	FURMAN	NON CONTRACT	1,271,000 SQ FT	\$6.45
VIRGINIA WESLEYAN	VA WES.	TOTAL CONTRACT	334,000 SQ FT	\$5.06
KENTUCKY WESLEYAN	KY WES.	NON CONTRACT	515,000 SQ FT	\$4.72
COVENANT COLLEGE, GA	COVENT	NON CONTRACT	280,000 SQ FT	\$4.29
BELLERMINE COLLEGE	BELLER	NON CONTRACT	412,000 SQ FT	\$3.59
ECKERD COLLEGE, FLA	ECKERD	CONTRACT CUST & GRDS	562,000 SQ FT	\$3.41
SALEM COLLEGE, NC	SALEM	CONTRACT MGT, CUST, & GRDS	542,000 SQ FT	\$2.90
ST. THOMAS UNIVERSITY, FL	ST. TOM	TOTAL CONTRACT	304,000 SQ FT	\$2.66
GUILFORD COLLEGE, NC	GUILFRD	TOTAL CONTRACT	695,000 SQ FT	\$2.54
SPRING HILL COLLEGE, AL	SP. HILL	NON CONTRACT	569,000 SQ FT	\$2.30
MILLSAPS COLLEGE, MS	MILSAP	NON CONTRACT	550,000 SQ FT	\$2.14
AGNES SCOTT COLLEGE, GA	AGNES	NON CONTRACT	750,000 SQ FT	\$2.06
WASHINGTON & LEE, VA	WASH LE	NON CONTRACT	1,221,688 SQ FT	\$1.89
PFIEFFER COLLEGE, NC	PEIFER	TOTAL CONTRACT	455,000 SQ FT	\$1.61
GEORGETOWN COLLEGE	GEORGETOWN	NON CONTRACT	629,025 SQ FT	\$1.53
MARYVILLE COLLEGE, TN	MARYVIL	NON CONTRACT	518,000 SQ FT	\$1.27

SHADED SCHOOLS ARE CARNEGIE
LIBERAL ARTS I

* Cost per square foot includes; the total cost of labor benefits, supplies, contractors, tools and equipment for Maintenance, Housekeeping, and Facilities administration.

NOTE: Not all institutions complete this survey.

Schools in our immediate region were unavailable.

NOTE: In 1988 Facilities Management began to purchase Natural Gas directly from the Well head.

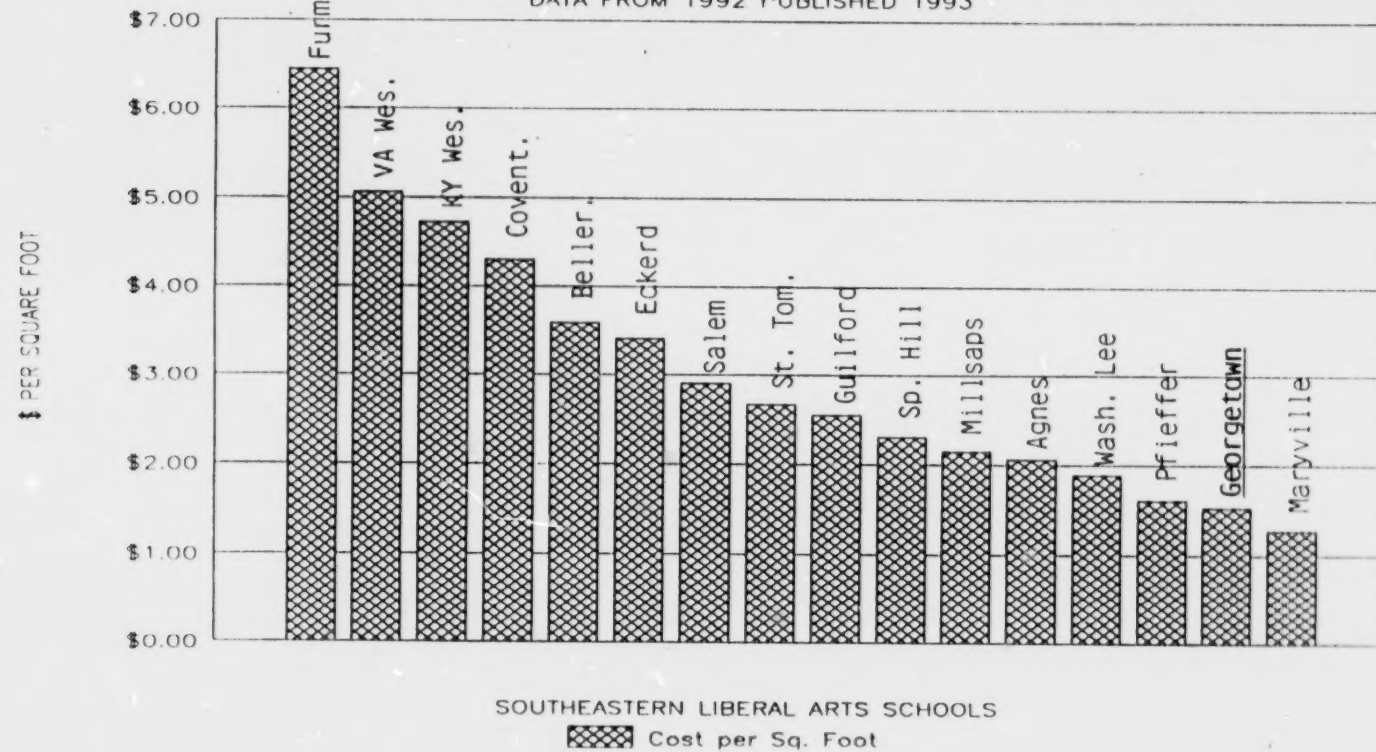
The immediate savings was \$50,000 per year. This totals in excess of \$250,000 in avoided costs.

SOURCE: APPA Comparative Costs and Staffing Report 1993

SCHOOL COMPARISON OF FACILITY COSTS AND STAFFING PER SQUARE FOOT

FACILITY COSTS AND STAFFING COMPARISON

DATA FROM 1992 PUBLISHED 1993

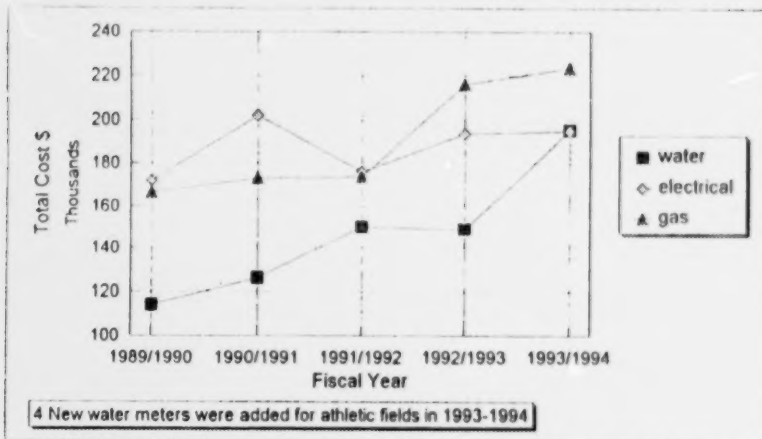


SOURCE: APPA Comparative Costs and Staffing Report 1993

GEORGETOWN COLLEGE UTILITIES 1989 - 1994

UTILITIES

	1989/1990	1990/1991	1991/1992	1992/1993	1993/1994
Water cost	\$114,081.93	\$126,276.01	\$149,972.97	\$148,744.23	\$195,519.25
Water use	17381.189	11058.395	12760.287	11488.558	29192.263
Cost per 1000 gal.	6.564	11.419	11.753	12.947	6.698
Electrical cost	\$171,866.98	\$201,941.02	\$176,110.79	\$193,554.62	\$194,964.57
Electrical use	4432945.2	5348527.2	4988928.9	5285477	5568590
Cost per KW	0.037	0.038	0.035	0.037	0.035
Gas cost	\$166,544.77	\$173,026.40	\$173,783.11	\$216,391.72	\$223,788.47
Gas use	50,509.20	49802.9	56131.3	55829.9	57857.6
Cost per MMBTU	3.297	3.474	3.096	3.876	3.868
Total Cost	\$452,493.68	\$501,243.43	\$499,866.87	\$558,690.57	\$614,272.29



Other utility costs that are not included above are; Salt, Boiler and Cooling tower treatment, as well as trash removal.

by: Jim Roberts

12/07/94

1995 APPA Proceedings

Traditional Reasons For Contracting Services

Volume Purchasing:

The purchasing power of a national firm provides purchases at a lower cost, which can be passed on to the institution.

Management Time:

Contracted services allow the institution to devote its time to its primary educational mission and purpose.

Operational Headaches:

Contracting relieves the institution of having to deal with crisis situations, personnel problems, and other operational issues.

Standardized Procedures:

Standardized procedures set in place by a contractor result in higher quality.

Controlled Costs:

Procedures and management set in place by contractors result in lower costs of operation.

Income Stream:

Contractors will guarantee a continuous income stream to the institution.

Labor/Benefit Costs:

Contracting services will relieve the institution of substantial labor and escalating benefit costs.

Professional Management:

Management oversight is provided by professionals and backed by the corporation.

Capital Upgrades:

Contractors will provide funding for renovations and cash for inventory, equipment, etc.

Facilities Management

Volume Purchasing:

Parts are currently purchased at or below state bid pricing. We utilize local vendors and vendors that are donors to the institution. We have contracts with vendors that include donations to the institution.

Management Time:

Properly managed self-operations allow for more flexibility and response to student, faculty, and staff needs. Contracts for facility operations require daily negotiations and decisions.

Operational Headaches:

The Facilities Department at Georgetown is operating a quality program that is effective and responsive. Dealing with operational issues allows the college to be in control of the decision making process with accountability.

Standardized Procedures:

All housekeeping staff have been through training sessions by vendors setting procedures for our equipment and supplies. Staff with maintenance have been trained in areas such as boiler treatment chemicals, electrical maintenance, back flow prevention, refrigerant reclamation, as well as specified training by vendors.

Controlled Costs:

Georgetown College ranks in the lower 25% of colleges expenditures on facilities. Our current cost is \$1.53 per square foot. (See attached cost comparison.)

Income stream:

Income from facilities is for rental properties only. Georgetown uses this as incentive for new faculty and staff.

Labor/Benefit Costs:

Currently of 21 housekeepers, 11 make \$5.25 or less per hour. Of the 21 only 12 are on the insurance plan. There are fifteen people on the Facilities staff that have served the college for 7 years or more and 10 have served the school for between 11 and 23 years. Benefits assist in retaining quality employees.

Professional Management:

The Facilities manager has 16 years management experience from four institutions, has a Masters Degree in Public Administration, has received training through the APPA Institute for Facilities Management and has attended the Executive Development Institute at Notre Dame. Support is available through APPA, The Association of Higher Education Facilities Officers having more than 2000 members nation wide.

Capital Upgrades:

Georgetown has spent more than \$1.2 million in the last year on facilities. Cash for inventory and equipment is a short term cash advance and would not provide for long term funding of operations.

Resources:

Contract Management or Self-Operation. A Decision Making Guide for Higher Education. Prepared by Coppers and Lybrand's Higher Education Consulting Group. Sponsored by The Council of Higher Education Management Associations.

The Implications of the Privatization of Campus Services: Is it in the best long term interests of higher education? By Mark Bookman, J.D., Education and Non-Profit Consulting, Inc.

NACS Annual Financial Survey

National Association of College Stores

National Association of College and University Food Services

National Association of College and University Auxiliary Services

1991-1992 Comparative Costs and Staffing Report for College and University Facilities. APPA, The Association of Higher Education Facilities Officers.

Actual proposals written by contract companies.

Conversations with department heads at the following institutions:

University of the Pacific School of Dentistry
Lafayette College
Villanova University
Swarthmore College
Rosemont College
Mt. Union College
Drew University
Rider College
Cuyahoga Community College
College of Holy Cross
Oklahoma State University
Vanderbilt University
Eastern Kentucky University
University of Kentucky
Grinnell College
NACUFS
Oklahoma University
Western Kentucky
University of Richmond
Furman University
Nichols State University
St. Mary's Childrens Hospital
NACUFS Member Services
SUNY/NACUFS President
University of Pennsylvania
Randolph-Macon College
Cumberland College
Meridith College
Midway College
Highpoint College
Mars Hill College

Other Issues

You can contract out performance, but not responsibility.

How does contracting relate to our mission and guiding principles?

Has progress on GPO's been unsatisfactory?

Contract employee loyalty is split between the contractor and the institution.

College expertise is lost when services are contracted out.

Institutional image is put into someone else's hand.

Contractors encourage management incentives based on short term financial goals at the possible expense of the campus.

Prices will rise.

A question of fair and ethical treatment of employees may affect the institutions's ability to retain or bring in quality talent.

The cost of contracting is directly related to their responsiveness and services.

Contract administration can be a major problem.

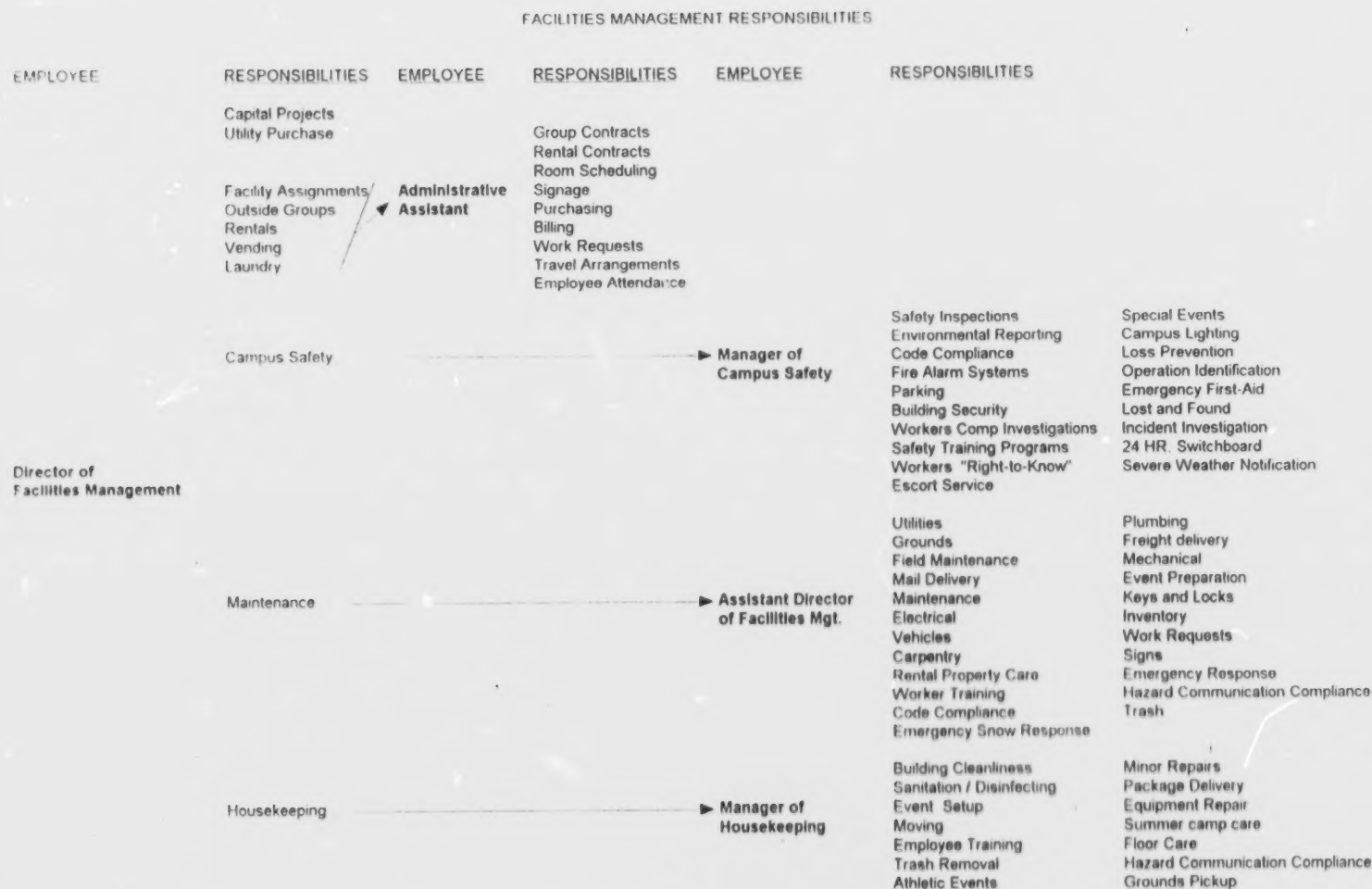
Every uncontracted request results in a negotiation.

Current vendor contracts might be jeopardized.

Current management has shown fiscal responsibility.

The service infrastructure is in place now - teamwork, responsiveness, communications, etc.

Responsibilities of Facilities Management not included in Maintenance and Housekeeping are: construction management, project drawings and specifications, natural gas purchases, vending services, laundry services, rental property management, summer programs, contract administration and review for current products and suppliers, facilities scheduling, and farm contracting.



All departments will be assigned tasks beyond what is listed. Two examples of this would be moving art work and picking up items off campus.

Facilities Planning, Design, and Construction

Integrated Building Commissioning Case Study: University Of Washing- ton Chemistry Building

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Abstract

Commissioning of the Chemistry Building demonstrates the value of Integrated Building Commissioning relative to other approaches. This case study describes the process of building commissioning in which the owner, designer, contractor and commissioning agent each play significant roles. The contractor, through a test engineer, schedules, coordinates and executes commissioning testing as specified by the designer. The commissioning agent, with the owners staff, monitors the contractors commissioning activities.

Project benefits include proper operation of this 100,000 square-foot variable air volume lab building with 200 fume hoods, orderly testing process, timely discovery of deficiencies, positive contractor attitude toward functional success, designer and contractor acceptance of responsibility for design problems and deficiencies, and owner staff involvement in testing. The effectiveness of building commissioning on future projects will improve by earlier initiation of design phase commissioning activities, improved periodic reporting of commissioning activities, and more detailed commissioning specifications, test procedures, and scheduling.

Introduction

The University of Washington has an antidote to the years of costly, embarrassing, frustrating problems associated with the operation of its new facilities; integrated building commissioning. On projects where the commissioning process has been well managed, the University has achieved a high level of operational integrity at the time of move-in.

Like many other institutions, the University of Washington found itself dealing with endless lists of problems discovered by occupants and operations personnel after new buildings were occupied. Contractors were slow to respond; consultants seemed disinterested.

As the University contemplated a period of vigorous capital construction activity, including four high-tech science research laboratory buildings, it was clear that "business as usual" would

not be satisfactory. The stakes were too high. These were expensive, high profile projects, intended to lure the nations top researchers. The buildings would house hazardous materials and processes. The usual volume of problems left to be corrected after occupancy would pose significant risks to health and safety. Failures that disrupted research would drive scientists away. The University would be viewed as having poorly managed \$200 million of state funds.

After months of persuasion, permission was finally granted to include building commissioning on all four buildings. Three projects were already in construction, or too far into design to incorporate commissioning in the bid documents. The fourth building, Chemistry, was still in design and had a mechanical/electrical design consultant who had experience with commissioning. Construction phase commissioning is complete on two of the four new science research buildings.

The new Chemistry Building is the model of commissioning as it will generally be pursued on future University projects. Though it would be characterized as the most satisfactory commissioning experience to date for the University, there are numerous lessons to be drawn from the experience.

All new capital projects now incorporate building commissioning. The Facilities Design Information (FDI) manual now contains standardized commissioning specifications for customization by design consultants on University projects. Soon those specifications will be available electronically via Internet on a World Wide Web site at the University of Washington.

New lessons emerge daily as commissioning proceeds on these projects. The results of those lessons are reflected in projects in early stages of construction or still in design. The \$90 million Electrical Engineering/Computer Science and Engineering Building bid documents incorporate the lessons learned, and is the most complete, comprehensive commissioning specification to date. The Henry Art Gallery Addition adapts the process for a small, complex project. The School of Business Administration Addition is a model of how commissioning can be modified for a mid-sized project of average complexity. Future projects will see continued fine tuning of the process of commissioning.

This paper explores what made commissioning more successful at the Chemistry Building than at the others. The following discussion starts with brief description of the building to better appreciate the magnitude and complexity of the commissioning task. The paper will then focus on the integrated commissioning process used for the Chemistry Building and the role of each commissioning team member. Integrated building commissioning will be contrasted with single party building commissioning. Lessons learned for continuing process improvement will be discussed.

Chemistry Building Description

The Chemistry Building contains approximately 100,000 square feet of undergraduate teaching laboratories, synthetic chemistry and aqueous chemistry research labs, plus office space for faculty and graduate research students. It is a five-story, cast-in-place concrete structure. The partial basement contains electrical and mechanical equipment. Rooftop penthouses contain exhaust fans. Each floor has a fan room for the supply air handler serving that floor.

This \$30 million building includes variable air volume (VAV) controls in labs with 144 VAV fume hoods. Airflow through the fume hood varies with the sash position to maintain a

constant face velocity of 100 feet per minute. Controls must restore face velocity to within 10% of setpoint within 5 seconds of a change in sash position.

A typical lab contains four fume hoods and two VAV supply air terminals with hot water heating coils. Each supply air terminal tracks the total flow of two adjacent fume hoods. The controller maintains a constant differential between supply and exhaust volume for space pressurization. In these labs there is so much make-up air required, even with minimum fume hood flows, that full cooling capacity is always available.

In other labs with fewer fume hoods, there is an auxiliary VAV exhaust terminal working in tandem with the supply and fume exhaust terminals. The controls adjust supply flow to track the sum of the fume exhaust and auxiliary exhaust flows. When the fume hood and supply flows are at minimum, there is less than maximum cooling available. When additional cooling is required, the auxiliary exhaust terminal opens and the supply follows to maintain negative space differential pressure and provide the additional cooling.

Two fume exhaust manifolds each serve about half of the VAV fume hoods. Each manifold has an exhaust fan at each end. There are controlled dampers at the inlet to each fan and at the center of the manifold. These dampers allow isolation of either fan for maintenance or when demand is low. An outside air bypass damper in each half of the manifold modulates to maintain constant static pressure in the manifold and constant volume through the fan.

This is not a course in VAV lab design. However, the foregoing should provide an appreciation of the highly dynamic control requirements. Rest assured, without an effective building commissioning program the Chemistry Building systems would still not be working as intended. There are currently some sound attenuation issues being resolved, but the VAV controls are working as intended.

By way of contrast, a commissioned building with similar VAV lab system design features is now operating in a constant volume mode while problem solutions are being sought. The building had been commissioned, but the process started after construction was under way. A third party commissioning agent was hired to perform all commissioning functions. Due to the late start, the process effectively excluded the contractor and design consultant. The commissioning agent was allowed to try to solve problems that should have been the contractors responsibility. Because the commissioning process was not effective, the University is still stuck with a malfunctioning building one year after occupancy.

Chemistry Building Commissioning Process

The Chemistry Building commissioning process is designed to verify the integrated functions of various building systems. It relies on integrating the activities of four parties as a commissioning team. Hence, we refer to it as "integrated" building commissioning.

The scope of building commissioning for the Chemistry Building included mechanical and electrical systems: plumbing, heating, ventilation and air conditioning, building automation system (BAS) controls and their network communication, fire and life safety, normal and emergency power, and primary voltage systems.

The total cost of commissioning was approximately \$350,000, including the contractors estimated commissioning cost, direct contracts with the commissioning agent and the testing, adjusting and balancing (TAB) firm, and the owners Physical Plant Department staff time. The

owners Engineering Services staff time is not included. Total building construction cost was \$30 million, with the mechanical portion of the work at \$7.5 million and electrical at \$3.3 million.

Cooperation of the owner, design professionals, the contractor and the commissioning agent was required to commission the Chemistry Building. The owner made the decision to proceed with commissioning and directed their architect and engineers accordingly. The owner hired the commissioning agent as a specialist to monitor the commissioning process and to advise the owner. The designers wrote the commissioning specifications for inclusion in the bid documents and participated in commissioning throughout the project. The contractor had major responsibility for commissioning activities.

Design Phase: During the design phase, the owner and designers formulated functional and technical programs. As the design proceeded, the scope of commissioning was established. Extensive discussions finally led to an agreement on how commissioning was to be accomplished. Specifications, including Division 17, Commissioning, were written and reviewed.

Construction Phase: The contractor, TAB firm and commissioning agent joined the commissioning team during the construction phase. The owner selected the TAB firm from proposals received from a list of approved companies.

The owner also issued a request for qualifications for firms to provide commissioning services on the four science building projects. Only two firms were found to have credible commissioning experience on projects of similar complexity and the combination of field experience and professional qualifications required. Each would provide commissioning services for two buildings, one of which was the Chemistry Building.

Many of the other respondents were design consultants or balancing firms with limited experience. The design consultants would have liked us to think that they had always been providing commissioning services as a part of their standard services. They lacked depth of operating expertise, and failed to grasp the proactive, designed nature of commissioning that differentiates it from punch lists and trouble-shooting when things go wrong.

Balancing firms, by contrast, were well seasoned in dealing with operational issues, but lacked the professional training and design experience. Their focus tended to be limited to the HVAC systems, lacking expertise in fire alarm and electrical systems.

Belatedly, the design consultant was requested to write basis of design and design intent documents to support the commissioning process. The basis of design document identifies design parameters used in the design process, but which do not appear explicitly in the bid documents. (Design indoor and outdoor humidities and temperatures, people and equipment loads, structural capacities, indoor air quality standards, zoning.) The design intent is a narrative description of the systems and how they are intended to operate. It provides information on design decisions that affect the ultimate design solution, such as redundancy and diversity, intended modes of operation in various seasonal conditions, etc.

Division 01 specifications required the contractor to hire a test engineer to manage, coordinate, schedule and perform commissioning activities in the contractors scope as required in Division 17. No one anticipated that the test engineer submitted by the contractor would be the project manager from the mechanical/electrical design consultant. After much consideration, the University agreed to accept the submittal. We reasoned that there is an inherent conflict of interest, accepted during design, in the position of the test engineer reporting to the general contractor. Therefore, if the test engineer had some conflicted interest due to their past ties to the design

firm, it was likely to be more of a problem for the contractor than the University. In retrospect, the potential conflict of interest appears to have caused no problems.

Once the test engineer was on board, discussions of the commissioning plan and schedule finally settled in to realism. Prior to then, the contractor had naively shown a two week period at the end of their master construction schedule for commissioning. As discussions progressed, the contractor came to understand that some commissioning functions needed to occur a year before scheduled completion. For example, as we discussed the schedule for some of the point-to-point and device tests on the BAS controls, it became apparent that the controls contractor would need clean power approximately six months earlier than the electrical contractor had planned on providing it. Had those discussions not occurred several months in advance of the controls contractors need for clean power, they would have been left to cram their testing into the last few weeks of the schedule, as is all too often the case. The technical expertise that the test engineer brought to the scheduling and coordination meetings reduced schedule overrun for the project. The commissioning agents participation in review of the commissioning schedule alerted the owner to other problems which the contractor had not recognized.

The test engineer was also busy observing the installation for compliance with the contract, but more importantly, for accessibility and proper installation. Knowing that the functional performance tests (FPTs) would rely on well-located sensors capable of accurate measurement, and access to control devices, this agent of the contractor became the owners ally. If the test engineer could not get to a device for testing, the owner would be unable to reach it for maintenance. The test engineer ordered numerous modifications to the installation due to access problems.

The general contractors mechanical-electrical coordinator later observed that he wished that the installation verification had been required on another project he was involved with concurrently. The other project was also being commissioned, but commissioning was being accomplished by a third party commissioning agent with minimal contractor involvement. The commissioning agent was discovering many problems which could have and should have been corrected earlier by the contractor. Instead, corrections in a substantially complete building were taking longer due to access problems and were resulting in damage to finished materials.

In addition to scheduling and coordination, the test engineer also was required to write and submit the FPT procedures. Weakness in the specification for this requirement resulted in lengthy discussions during testing regarding what constituted adequate testing procedures.

Testing started with traditional static testing for pipe and duct leakage. Some two miles of welded stainless steel ductwork was tested for near-zero leakage.

Once we had verified the containment integrity of the pipes and ducts, attention turned to component-level FPTs. In the BAS controls, every damper and valve actuator motor was commanded through a full range of motion. This testing verified that the actuator was connected to the correct terminal at the controller, and that the wire terminations were not reversed. It also proved that the actuator itself was capable of the function for which it was installed. Each temperature, pressure, flow and current sensor was also tested for appropriate response to a change in sensed variable. This is not calibration, but just a verification that the sensors produced appropriate feedback. A similar procedure was performed for the fire alarm system.

The contractor was required to certify that each device had been successfully tested by presenting a precheck list of all devices. The technician signed off and dated each device on the precheck form.

The BAS contractor found in performing the prechecks that a series of air terminal unit damper actuators lacked the power to move the damper through a full stroke. They ordered and installed replacements for some 200 actuators immediately, with no more hounding from the owner or design consultant than to ask how quickly they would complete the changeout. Imagine discovering that problem with only a couple of weeks until occupancy, or worse, after the building was already occupied!

Having successfully demonstrated the function of all related control devices, major pieces of equipment could be started-up. Start-up generally proceeded without trouble.

The TAB firm was then brought in to begin balancing and to assist in calibration of flow sensors. Balancing proceeded much more smoothly than on other projects; the controls were already tested, corrected and proven functional. The balancer observed that his bids normally assume about 50% of the time on a project will be unproductive. By contrast, he estimated he had only experienced about 10-15% lost time on the Chemistry Building.

Nonetheless, while sensors had been proven functional in device testing, balancing tested them at their operational limits, and found problems. A series of airflow sensing transducers gave invalid signals at flows near the bottom of the design range. Extensive testing by the controls contractor and the manufacturer over a period of three weeks, finally identified the problem. The transducers had never been tested for operation with a long wire connection between the transducer and the control module. In this installation, in order to get the minimum delay in the pneumatic signal, the transducers had been installed close to the flow sensing tube (long wire, short pneumatic tubing). Normally, they were installed in or near the control module (long pneumatic tubing, short wire). The inductance of the long wire created problems for the transducer microprocessor circuitry. All 150 transducers were removed and sent back to the manufacturer for modification and then reinstalled.

As balancing was completed on systems, FPTs proceeded. Systems were exercised in all modes of operation. Relatively few surprises were found at this level of testing. Occasionally, devices were found to have failed since the initial tests. Sometimes, software had been inappropriately modified, or a sequence of operation had been misinterpreted.

Once each of the systems was proven functional, intersystem testing proceeded. The normal power circuit was disconnected, allowing the automatic transfer switch to connect emergency power. All equipment and controls which were scheduled to be operational on emergency power were verified, including the various fire/life safety functions, elevators, and fume exhaust fans.

On another project, however, the emergency power test became very interesting. When normal power was disrupted, emergency power connected as required, and all equipment scheduled to run did so. But when normal power was restored, we found out the BAS computer had been logging equipment failure alarms for all the equipment which had not been scheduled to run while the building was on emergency power. The result was that four hours after normal power was restored, the BAS computer was still busy clearing alarms. It had still not restarted any of the equipment. Had we not performed that intersystem FPT, we would have found out about the problem when we had a building full of irate people who had no ventilation, air conditioning, or cooling water for their research equipment.

At each stage of testing, deficiencies were discovered, corrected and retested until satisfactory results were obtained. Testing started at the lowest levels of complexity and progressed to

ever more complex functions. Most of the problems and deficiencies were discovered and corrected at the lower levels, when diagnosis was simple and responsibility was difficult to dispute.

Benefits Of Integrated Building Commissioning

All members of the commissioning team benefited from the success of the integrated building commissioning process at the Chemistry Building. The owner obtained a sophisticated facility that works as intended without excessive budget or schedule problems attributable to operational problems. The design team saw their concept take form and operate as they intended. They had fewer cases of being unjustly accused of faulty design when something did not work right. The contractor saw the benefits of a more rational schedule of activities related to the final stages of construction. The contractor also was able to correct deficiencies while the right people were still on site and had reasonable access to do their work. Callbacks will be greatly reduced, and limited to true warranty work; fixing things that just did not last long enough. There are fewer outstanding issues awaiting resolution, blocking approval of the contractors request for final acceptance.

Lessons

Commissioning of the Chemistry Building was successful and provides the model for future building commissioning at the University of Washington. It was not without flaws. We have learned a great deal in the process.

Among the improvements we have already instituted or will soon accomplish are the following.

1. Balancing on large projects should be included in the contractors commissioning responsibilities. Balancing is so intimately tied with the other commissioning activities, that to try to coordinate an independent balancing firm with the contractors activities is difficult and fraught with the potential for delay claims. It is necessary to specify and to enforce random sampling verification of the balancers readings, but that is true regardless of who hires them.
2. Commissioning specifications must be very precisely written. The contractor must be able to bid commissioning requirements with as much confidence as they do any other section. To some degree, that will only come with time and increased familiarity with the process. If the specifications are not clear, contractors will not be able to bid competitively. Functional performance test specifications must:
 - a. Identify which equipment and systems are to be tested.
 - b. For each equipment or system, identify which functions are to be tested.
 - c. For each function, identify conditions under which the tests are to be performed.
 - d. For each set of conditions, identify the range of acceptable results.
3. Include in the general conditions of the specifications requirements for and definition of "functional completion." Functional completion is a milestone which occurs at some fixed period of time after substantial completion is approved. Functional completion is granted only after the final commissioning report is accepted. It will precede final acceptance, and be a condition of final acceptance. Liquidated damages penalties can be attached to failure to meet the functional

completion date, in the same way liquidated damages are assessed for failure to meet substantial completion.

Specify a high standard for the functional performance test procedures to be written and submitted by the test engineer. The test procedures must be detailed instructions to the test technician, tailored to the specific equipment and installation. There must be sufficient detail to allow a qualified technician to perform the test without further instruction. The procedure should be sufficiently clear that the tests could be repeated under the same conditions with identical results. If detailed procedures are not available during testing, confusion results over what should be done. Further confusion will arise in trying to evaluate the results of the tests.

Select and engage the commissioning agent early in the design phase. Their input in writing the commissioning specifications and in reviewing the design for functional issues will improve the project.

Include the basis of design and design intent documentation requirements in the designers basic services agreements. Insist that the documents be updated and submitted at each stage of the design. Even the designer forgets some of the rationale for why they made certain design decisions very soon afterwards. While documentation written after the design phase is better than none at all, it is prone to errors.

Although it is beyond the scope of this paper to explore in depth, management of the commissioning process is critically important to its success. If contracts are not enforced, if direction is given outside of established contract channels, if people are not accountable for their actions, the commissioning process will be mired in trouble.

Conclusion

Integrated building commissioning at the Chemistry Building contributed to the functional success of a complex, sophisticated building. The integrated approach avoided problems experienced in other University of Washington projects which have been commissioned recently. The success of the integrated commissioning method is due in large measure to taking advantage of the strengths of each member of the commissioning team. The lessons learned from the Chemistry Building commissioning experience will strengthen an already powerful model for successful building commissioning.

HVAC System Commissioning

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Introduction

Commissioning is a concept currently in the process of being formally defined. Numerous industry groups have published and/or are in the course of publishing their interpretation of what commissioning is and how it should be implemented. These groups include SMACNA (Sheet Metal) (Ref. 1), Bonneville Power Association (Ref. 2), and ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers (Ref. 3).

Prior to and concurrent with these efforts at standardization, construction industry professionals have been asked to provide commissioning services for clients, even before the term commissioning was applied to the work. This paper represents the culmination of the authors professional experience with commissioning and its benefits and is intended as a rudimentary introduction to the process.

Although this paper is titled *HVAC System Commissioning*, the most common type of commissioning performed to date, the concepts and implementation approaches presented here are equally applicable to electrical, fire protection, life safety, and/or whole building commissioning.

What Is Commissioning?

There are about as many definitions of commissioning as there are projects which might need to be commissioned and as there are people who are interested in providing commissioning services. We will present three definitions of increasing complexity and detail which represent the evolution of a consensus of many industry professionals who have met to discuss commissioning over the past three years (Ref. 4).

Definition No. 1

Commissioning is verifying that systems perform as required to meet the needs and expectations of the owner.

Definition No. 2

Commissioning is a systematic process of assuring that a building facility performs efficiently in accordance with the design intent and the owners operational needs.

Definition No. 3

Commissioning is a systematic process of assuring by verification and documentation, from the design phase to a minimum of one year after construction, that all building facility systems perform interactively in accordance with the design documentation and intent, and in accordance with the owners operational needs, including preparation of operation personnel.

Why Is Commissioning Needed?

Commissioning is needed for various reasons, some of which are as old as the building industry itself.

More Complex and Powerful Systems

Commissioning, as a process for verifying that a buildings systems function properly, is not a new concept. Historically, however, the effort involved in testing and evaluating systems have been as simple as the systems themselves. A typical single family dwelling, for example, is commissioned when the furnace is put into service. If it heats when the thermostat calls for heating, it is determined to work properly.

As building systems have become more complicated and intertwined, e.g., an HVAC system used for fire/smoke control as directed by the fire alarm system, the process of commissioning also becomes more complex. This has lead to the "new" service called commissioning, typically performed by experts well versed in different systems, controls, and interactions and how to test them in an organized and meaningful fashion.

Energy Efficiency

Since the early 1970s facilities owners and managers have typically put energy conservation at or near the tops of their priority lists. The **direct correlation between energy efficiency and improved cash flow** is obvious for any organization.

Utilities have either voluntarily or by legislative mandate introduced rebate programs for progressive energy conservative systems, i.e., variable speed motor drives, upgraded controls, thermal storage, cogeneration, etc. However, they have discovered that the projected energy savings anticipated from individual energy conservation measures (ECMs) have not been realized to their fullest when not commissioned following installation.

A recent utility industry study has shown that commissioning ECMs has increased energy conservation program effectiveness significantly (Ref. 5).

Safety

In a number of different applications, there are **health and safety implications to not having the mechanical and electrical systems functioning properly**. Examples of this include laboratory facilities where exhaust systems are required to remove hazardous chemical fumes and vapors, fire alarm and smoke control systems which could have tragic consequences if not properly commissioned, and everyday workplace indoor air quality (IAQ) issues. There are innumerable examples of existing building HVAC systems which have closed outdoor air intake dampers as a result of poor system commissioning or manual overrides by untrained operating personnel.

Accreditation Requirements

More and more industries and businesses are compelled to become accredited by their respective "watchdog" groups. These industries include hospital and other medical facilities, animal research laboratories, pharmaceutical research and production facilities, etc. The process of **commissioning fits the accreditation process** as a means of documenting and verifying system performance at startup and periodically throughout the life of a facility.

When Is Commissioning Performed?

Although in reality commissioning can be started at any time during a building project, we will present three typical scenarios, the first of which is considered ideal for achieving the most success from the commissioning process.

Design Through Occupancy Commissioning

The commissioning process which begins early in the design phase of a project and extends into occupancy of a new facility is the industrys **ideal scenario**. A commissioning agent or authority (CA) is brought onto the design team at the same time the projects goals and objectives are being developed.

The CA serves as the **owners technical liaison** throughout the design, construction, and startup phases. In this capacity it is the CAs responsibility to keep communication open between the owner and the design team and to interpret the owners wishes in light of the technical requirements of the project. The CA is the "keeper of the gate" when it comes to reviewing the design engineers plans for compliance with the owners intent. The CA also makes sure that the design is "commissionable" in the sense that components necessary for meaningful verification testing, e.g., temperature and pressure gauges, flow meters, control system interfaces, etc., are included in the design.

During the design phase of a project, the CA will serve in the following capacities:

- Help to define the design criteria, e.g., temperature, humidity, pressurization, smoke control requirements, etc.
- Prepare design intent document detailing the design criteria.
- Review design drawings for conformance to design intent.

- Develop verification test procedures concurrent with the design of the mechanical systems themselves.
- Help to develop the construction specifications, particularly with regards to the special tasks required of the contractors for commissioning.

During the construction phase of a project, the CA will perform the following tasks:

- Review critical equipment shop drawings.
- Review control system submittals.
- Consult on impact of proposed changes, substitutions, or value engineering.

Finally, during the startup phase of a building project, the CA will:

- Conduct and document verification tests.
- Review air and water balancing reports.
- Review operations and maintenance manuals.
- Enhance operations and maintenance manuals with narrative descriptions of the installed systems and the theory behind their design and control strategies.
- Oversee or conduct operator training and education.

Post-construction Commissioning

Although design-through-occupancy commissioning is an ideal, the **post-construction mode of commissioning is still the most prevalent**. A specialist in system analysis, testing, and commissioning (the CA) is brought into a construction project typically following substantial completion when the owner realizes there are problems with the installed systems and looks for help.

The role of the CA in this scenario varies considerably from the design-through-construction scenario, because the **CA is most often an outsider** who was not involved in the design, construction, or the problems and politics inherent to both. The CA may walk into a delicate situation where design and construction team members have been attempting to resolve the apparent system problems with little or no success. They may not be interested in having an outside "know-it-all" enter the process. Therefore, conciliatory and professional interpersonal skills are extremely important qualities for the CA (Ref. 6).

As part of post-construction commissioning, the CA will learn about, evaluate, test, and document the installed building systems. Often, the CA will also be closely involved in operator training as a part of or following the commissioning procedures.

In order to **learn about the building systems**, how they were designed, and how they were installed, the CA will:

- Meet with the owners, designers, occupants, and operators in order to understand original system intent and actual performance. These interviews will also shed light on some of the non-technical aspects of the building project, including budget constraints, political agendas, and personality conflicts.
- Review design and construction documentation, including equipment shop drawings, control system submittals, as-built drawings, etc.

In the process of **evaluating the building systems**, the CA will:

- Analyze the installed systems ability to achieve the design criteria.
- Recommend modifications to equipment or control strategies, if required to achieve design criteria. These recommendations are made prior to the development of verification tests in order to prevent testing systems which arent physically capable to achieving desired performance.
- Recommend "work around" solutions to make installed systems work better. Many times the post-construction solutions to system problems are prohibitively expensive or disruptive, especially following a large and costly construction project. These work arounds are intended to provide the best performance from the existing hardware, even if it doesnt meet the owners exact requirements.

The process for the CA to **test the building systems** is as follows:

- Develop verification test procedures for each installed system.
- Conduct verification tests.
- Document test procedures and results.
- Retest systems in which problems were identified following correction of the problems.
- Verify accuracy and completeness of the air and water balancing report.

In order to help ensure continued proper operation of the systems following commissioning, the CA will often be asked to **document the building systems** for future reference by operating personnel. This work can include:

- Reviewing contractor-prepare operations and maintenance manuals.
- Enhancing those operations and maintenance manuals with a narrative description of the design intent and theoretical discussion of why the systems were designed and installed as they were.

Finally, as another step towards realizing consistent operation into the future, the CA can perform **operator training** in the following capacities:

- Working with the operators throughout the verification testing phase of commissioning. The hands-on experience and casual discussions of system performance proves invaluable as a training tool.
- Conducting formal training sessions with the operators in a classroom or field setting.

Existing Building Commissioning (Recommissioning)

Recommissioning **existing building systems of any age** can reduce energy consumption, improve indoor air quality, and improve temperature and relative humidity control. In addition, it is an opportunity to analyze the air and water system balance within a building and optimize distribution system performance. In a building in which multiple architectural renovations have taken place over a period of time, recommissioning offers an opportunity to re-evaluate the mechanical and electrical systems in light of the new building arrangements, aspects of "small" renovations which are often ignored during their implementation.

The CAs role in **recommissioning** includes the following:

- At the outset, existing building commissioning is very similar to post-construction commissioning; including interviews with the owners, occupants and operators to learn the

history of the building and its systems. The CA also needs to review as many of the available original and subsequent renovation design documents as possible to trace the retrofit history of a building and the effect those retrofits have had current system performance.

- Also, the CA must analyze the existing systems abilities to meet the owners operational requirements, especially in light of any changes in those requirements since the building was built. For example, when many older buildings were built there was little or no thought given to energy costs, but current building owners are likely to be very energy-conscious. Energy savings goals may be an important part of the owners operational requirements.
- After evaluating the existing systems, the CA will likely make recommendations for modifications to the existing systems in order to better achieve the owners performance goals. These recommendations can include anything from equipment, controls, and rebalancing.
- The CA will then work with the owner in planning, phasing, and implementing the recommended modifications. From this point, the existing building commissioning process reverts back to the design-through-occupancy mode of operation, because the project has turned into a design and construction project which will require attention to commissioning.

How Is Commissioning Performed?

Regardless of the mode of commissioning undertaken, the following tasks can be part of the CAs responsibility:

- Help develop and define owners design criteria.
- Evaluate design for conformance to criteria.
- Develop, perform, and document verification tests.
- Prepare final report.
- Prepare system documentation.
- Prepare preventive maintenance plans.
- Conduct operator training

Verification Tests

Although it may be possible to standardize on the performance characteristics to be tested for different types of systems, e.g., boilers, chillers, variable speed pumping, air handling units, etc., the **methods for performing those tests must be custom tailored** to the particular hardware and software capabilities of individual installations. For example, centrally controlled direct digital control (DDC) systems with full graphical display interfaces tend to provide many more commissioning tools, capabilities, and feedback mechanisms than stand-alone pneumatic systems. Therefore, the test procedures need to be developed in a realistic manner to achieve proof of performance with the equipment available.

Verification tests are organized to **systematically exercise all of the control strategies** under all realistically conceivable scenarios. These scenarios include different seasons, e.g., winter,

summer, and transition seasons; and operating conditions, e.g., free cooling versus minimum outside air, occupied versus unoccupied, normal operation versus smoke control or evacuation mode, heating versus cooling, humidification versus dehumidification. Again, depending on the sophistication of the tools available to the CA, it may be possible to test the performance for all seasons, regardless of the time of the year tests are conducted. This can be achieved with DDC systems by "faking out" the computer control system with false manual inputs. Local pneumatic or electric control systems typically do not share this advantage, and verification tests may actually have to be performed at three different times of the first year of occupancy.

Because air and water system balancing is so crucial to proper operation of mechanical systems, verification tests will often include **spot checking of the balancing reports** by the CA or an independent balancing contractor working with the CA. If the random spot checks of the balancers final report indicate a pattern of discrepancies, the original balancing contractor will be asked to return to the building to rebalance all systems and submit a new report.

Finally, it is critical to **document all verification tests**; what was tested, what the results were, what corrective action was taken, and what the final results were following retesting, if required.

Final Report

A final commissioning report will provide a description of the building and its systems, particularly those which were commissioned; the design intent or, in the case of recommissioning, the owners new operational requirements; and the verification test documentation.

System Documentation

In addition to the final report, which is typically prepared for administrative personnel, **system documentation can be developed for use by current and future building operators**. This documentation may include enhanced operations and maintenance manuals, as described previously; detailed system schematics and control strategies; points lists with initial setpoints; zone/system database; and/or zone floor plans.

The **zone/system database** is a database which, at a minimum, correlates building room number with air handling systems, exhaust fans systems, hydronic piping systems, etc., to aid operators in fielding "trouble" calls from building occupants. At its most extensive, this database could include air flows to and from each room, water flows, room type, lighting loads, etc.

The **zone floor plans** are usually color-coded to show which rooms are served by which systems. Both these and the zone/system database, if kept up-to-date, are dynamic tools which can keep operations personnel on top of changes made to their buildings. They also prove invaluable whenever the building is ready to be recommissioned. A significant amount of the recommissioning CA fee goes towards reconstructing the renovation history of a building, and much of this work can be avoided by diligent record-keeping by operations personnel. The database and floor plans provide an easy-to-use, relatively fast way to record changes throughout the life of a building.

Preventive Maintenance Plan

After becoming intimately familiar with a new or existing buildings systems, the CA is in a **good position to help develop preventive maintenance (PM) plans** for a facility. The CA can do this by extracting PM requirements from the operations and maintenance manuals; documenting individual tasks and their labor requirements; and scheduling work evenly across the year, taking into account normal downtimes for seasonal equipment.

Operation Training

As described previously, the CA is also a natural choice to conduct in-depth operator training for new and modified systems. System operators can not be expected to maintain continued proper operation of a commissioned system if they don't know how its intended to perform and why. **New technologies and control strategies need to be explained and justified** so that building operators will "buy into" the new system.

Hands-on training can occur during verification testing if the operators are asked to participate, and formal classroom training will provide the theoretical background for understanding the system design. It has become common practice to video tape as much of the training as possible for use in training newly hired operators in the future.

Who Performs Commissioning?

It seems as if everyone wants to perform commissioning, and its possible that each group is appropriate for commissioning certain types of projects. This paper is not intended to be a proponent of any one group over another. The following is a list of people who could perform commissioning:

- Installation Contractor
- Balancing Contractor
- Design Engineer
- Third Party Professional
- Owner

The advantages and disadvantages of using these groups as CAs are described below.

Installation Contractor

The installation contractor is the **party responsible** for the final proper performance of the installed systems, and the results of verification testing are partly a measure of the contractors care in carrying out the contract documents. However, if the contract documents are not appropriate for achieving the owners design criteria, the installation contractor may not have the theoretical technical expertise to determine exactly why and what should be done about it. For similar reasons, most contractors are probably not well-suited to act as the owners technical liaison during the design phase of a project.

In standard bid construction projects, the contractor has an obvious **conflict of interest** with regards to acting as the commissioning agent. However, with a performance-based compensation

approach, the onus is on the contractor to prove that the installed systems perform to meet the owners requirements prior to receiving final compensation for the work (Ref. 7).

Balancing Contractor

A certified balancing contractor should certainly be **capable of performing the balancing tasks** associated with commissioning, but expertise in controls is a prerequisite for CAs which typically is not associated with balancing work. In addition, **theoretical technical expertise may be limited** with balancing contractors as well as installation contractors.

Balancing contractors performing commissioning can do so working directly for the owner or working for the contractor. The latter scenario may lead to a conflict of interest.

Design Engineer

The design engineer is probably **most familiar with the systems** to be commissioned, but there may be a **conflict of interest** if system problems turn out to be design-related instead of contractor-related. In addition, good design engineers are not necessarily good CAs. A special expertise in commissioning is desirable.

Third Party Professional

A third party professional is **responsible only to the owner** and, therefore, conflict of interest concerns disappear. A third party professional, however, **may be more costly** due to the learning curve time required to have the CA learn about and review the building systems. This review process, however, has proven cost-effective in many projects in which design errors, inconsistencies, and unclear specifications could have lead to costly change-orders or improperly installed systems if not caught early enough.

A third party professional can also bring a **specific expertise** to a project team whose designers, although good technicians, may not have the experience or training required to work independently on special environments such as clean rooms, archives, laboratories, hospitals, etc.

Owner

If an owners facilities are extensive enough, an **on-staff professional CA** may prove to be a good investment. This professional could serve as CA on all projects or could serve as CA on some projects and oversee outside CAs on other projects. The biggest advantage to this approach is a **consistent commissioning program** which, if there are enough projects to warrant a full-time person, can be less costly.

Cost Of Commissioning

Because commissioning is still in the process of being defined and standardized, nailing down a cost for commissioning is especially challenging. In this section we will present cost implications of commissioning, including empirical data, implementation cost factors, and potential long term cost savings.

Empirical Cost Data

From data available to date, we have some empirical cost information for including commissioning on a design and construction project. The level of commissioning, the scope of construction, and the method of tracking costs are all variables which make much of the following information of limited use. The costs should be considered ballpark at best and should not be used for budgeting any particular commissioning project without further analysis.

Canadian Study: (Ref. 8)	1-3% of HVAC Const. Cost
Montgomery County, MD: (Ref. 9)	1.2-2.8% of Const. Cost
San Francisco Main Public Library: (Ref. 10)	1.2% of General Const. Cost
Pacificorp (>12,000 ft²) ECMs Only: (Ref. 11)	\$0.02-0.64/ft ² (Avg=\$0.21/ft ²)
United Illuminating ECMs Only: (Ref. 12)	\$0.20/ft ²

Implementation Cost Factors

The following are variables which will affect actual project commissioning costs:

- Number of systems commissioned
- Complexity of systems
- Tools available
- Type of commissioning
- Level of detail required
- Allocation of costs
- Size of facility

Table 1, developed by the University of Wisconsin (Ref. 13) is an attempt at quantifying the affect on commissioning cost of building size, system innovation, and whether or not it is an industrial system being commissioned.

Table 1. Economics of Commissioning Process (Ref. 13).				
Building Description	Commissioning Cost	Design Cost	Construction Cost	Operation Cost
Small Building	+3%	+5%	No Change	-8%
Large Building	+2%	+3%	-6%	-10%
Innovative System	+3%	+6%	No Change	-15%
Industrial System	+1.5%	+1%	+2%	-12%

Long Term Cost Implications

Commissioning has the potential for long term cost savings which, theoretically, could result in owners electing to perform system commissioning with **payback** in mind. The following are just some of the possible long range cost benefits of instituting an effective commissioning process.

- Reduced operating and maintenance costs. A properly documented building will be easier and less time-consuming to maintain.
- Improved energy efficiency may be one of the best reasons to perform commissioning with payback in mind. A well-designed, constructed, and commissioned building will consume less energy than the same building if it is not commissioned (Ref. 11)
- Increased occupant productivity. If indoor air quality controls have been commissioned and are operating properly, the owners or tenants personnel will be more productive, have fewer sick days, and will be less likely to develop sick building syndrome symptoms.
- For industrial, research, or archival facilities, the value of their processes, experiments, and/or collections can be orders of magnitude greater than the cost of commissioning. If these processes, experiments, and/or collections are reliant for their well-being on the building environmental control or electrical systems, a price sometimes cannot be placed on a loss due to improper control or malfunction of the systems.

Benefits Of Commissioning

The following is a summary of the benefits of commissioning from a building owners perspective:

- Commissioning eases the transition from construction-to-occupancy. Potential system problems are more likely to be discovered earlier if verification testing is performed. The earlier problems are found, the easier it typically is to receive prompt attention from the parties responsible for correcting the problems. This is especially true if verification testing is conducted prior to final payment to the contractors and designers. Another factor significant in improving the building turnover period is the potential for more formal and in-depth operator training available with commissioning. Clearly, the better prepared the final building operators are, the more smoothly they will take over the new or renovated systems.
- In general, a building whose HVAC systems have been commissioned will have better environmental control, i.e., temperature, humidity, and pressurization control, than buildings which are not commissioned.
- Similarly, the indoor air quality in commissioned buildings is likely to be better than in non-commissioned buildings, due to the verification of proper outside air intake and filtering controls.
- The energy savings realized as a result of commissioning are very real but difficult to quantify, because all construction projects are unique and it is impossible to reliably predict the quality of the control systems without commissioning. Experience has shown,

however, that there are numerous energy conservation-related anomalies found during verification testing that may never have been corrected without the commissioning process. Without commissioning, therefore, the owner may have paid higher energy costs throughout the life of the facility.

- In addition to the immediate system configuration verification for energy conservative performance, the operator training portion of commissioning helps to ensure the persistence of savings in the future. Inadequately trained operators will be more likely to make changes and/or adjustments which could result in the discontinuation of the initial energy conservative strategies.

In conclusion, commissioning is an old concept which has become a significant undertaking with the advent of complex, inter-related building systems and the relatively recent emphasis on energy conservation and indoor air quality. There are many ways to implement a commissioning program for various levels and types of building projects, all of which could benefit from commissioning. As the industry continues to gather and consolidate data from individuals and groups performing commissioning, more information will be available to make a quantitative case for the benefits of commissioning.

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Grounds Improvements For A Safe Campus Environment

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During the past several years, colleges and universities have witnessed an increased concern and emphasis placed on campus safety by their students, faculty, and staff. Statistics from campus police and security forces reveal a growing occurrence of assaults, both on and in the proximity of our nation's college campuses. We have experienced this unfortunate trend at the University of Virginia and are designing and implementing grounds improvement projects with safety, as well as the traditional values of aesthetics, in mind.

The University of Virginia is located on approximately 1,000 acres in Charlottesville, Virginia, a relatively small college town of 50,000 people in a semi-rural area of the state. With an enrollment of 18,000 students, and a staff of over 10,000, the University is the prominent employer in the area. While the security challenges we face at the University of Virginia may be different from those in urban settings, we believe that many of the elements of our safety program are applicable to all campuses.

Campus Safety Strategies

An effective grounds safety program is based on planning concepts, design strategies, safety criteria, education, and community involvement. As our program at the University of Virginia has evolved over the past decade, it has become more comprehensive, and hence more effective.

Due to the recent emphasis on safety, our master planning and site design processes are more sensitive to safety issues. In the layout of buildings, walks, walls, roads, and parking lots we look for concepts that will reinforce safety. Where possible for example, we prefer to link our vehicle, bicycle, and pedestrian routes together so that traffic is concentrated in corridors. We believe this approach improves surveillance and minimizes isolation.

Our safety criteria set design standards for lighting, circulation, and landscaping. While these are based on national standards they also reflect our experience and observations.

Education has received increased emphasis over the last several years. Each year we hand out copies of our lighted pathway drawings to students during their orientation. We also post laminated copies of this drawing in all dormitories and in our "commons" buildings. We schedule review sessions with the dormitory resident staffs. Finally, we have begun involving the faculty by asking them to discuss safety issues with their classes. This approach was proposed by a faculty member.

As in most large institutions, the University of Virginia often considers policies and procedures with input from a wide segment of the community. Several University committees, with membership of students, faculty and staff, have input to the issues related to exterior lighting. The prominent committee promoting improved lighting is the Security and General Safety Committee. The committee receives input from the community regarding safety initiatives, surveys existing conditions, and prioritizes safety improvement projects. The Arboretum and Landscape Committee reviews and approves both master plan concepts and individual projects related to changes to the appearance of the grounds, including lighting improvements. Other groups involved include the Parking and Transportation Committee, the Office of the Architect for the University, and, of course, the Facilities Management organization. While such a wide array of participation provides the opportunity for gridlock, we think the feeling of inclusion by students, faculty, and staff promotes communication and a cooperative effort to make the right kinds of improvements with a comprehensive approach.

Elements Of Campus Safety

Since most of the assaults on our campuses occur at night, the obvious response is to increase both light levels and coverage. However, while lighting is a key element of a safe environment, it is not the sole determinant. There are other factors such as isolation, surveillance, and circulation which set the framework for safety.

Isolation

People tend to perceive isolated or low traffic areas as unsafe. Remote parking lots, walks in densely wooded areas, and academic precincts, which are deserted at night, are examples of spaces that can be perceived as unsafe. The old saying that there is safety in numbers is a basic tenet of a safe pedestrian environment.

Our experience has shown that heavily trafficked spaces with relatively low light levels are usually considered safer by students than well-lit remote areas. Perhaps the most dramatic example of this is the Lawn, the University's signature quadrangle. This space has very low light levels, and has been the brunt of cartoons in the student newspapers. When we began a series of student safety surveys several years ago, we assumed that the Lawn would receive very low grades. To our surprise, the majority of students felt that it was safe due to the faculty homes and student dormitory rooms that line this space. They believed that a call for help would be heard by many of the residents. In contrast, some of our most brightly lit areas are often considered unsafe due to a sense of isolation. By developing pedestrian routes and parking areas that

are in the proximity of active, well-traveled areas, we have been able to improve campus circulation with safety in mind.

Surveillance

People feel most comfortable when they can see what lies ahead and when there are no potential hiding places. This requires that adequate light be provided not only on a walk or in a parking lot, but also on the areas adjacent to them. It also requires an understanding that seemingly innocent landscape elements, such as walls, building corners, shrubs, and trees, which during the day are positive aesthetic features, at night can be potential hiding places.

Applying the concepts of surveillance and isolation does not mean that our campuses need to be barren, treeless landscapes. They can be a mix of spaces with a variety of landscape types and walk alternatives, and still be considered safe. As an example, one of our dormitory complexes frames a wooded dell. One evening on a way to a meeting I was behind four students — two men and two women. When we got to this complex the two male students took the path that led right through the dell. The two women took a path that ran in front of the dormitories and, thereby, effectively skirted the dell. When we reached the other side of the dorms, I asked the students why they chose the paths they did. While the two males were not at all concerned about safety, the women stated that they took the dell path during the day and the other path at night. The latter path was more open with fewer trees and was closer to the dorms. It was not isolated, and it was visible. While the women avoided the dell at night, they enjoyed it during the day, and did not want to see the trees cut down in the name of safety. They also appreciated the fact that there was a convenient, "safer" alternative walk which they could use at night. So, obviously, the sense of visibility is an important safety aspect to consider when designing grounds access. Visibility includes both being able to see well and to be well seen.

Lighting Standards

An effective exterior lighting program is dependent upon a comprehensive approach combining engineering design criteria, aesthetic standards, and economics. Many campuses may be faced with additional factors such as dark sky concerns, historic district standards, municipal requirements, energy considerations, or other items depending on the unique nature of the campus.

The first obvious question in a comprehensive lighting program is where to install lighting fixtures. How does an institution determine the priorities for areas needing lighting improvements? At the University of Virginia we developed a walk system designated as "The Lighted Pathway". The pathway connects all major academic facilities, student life facilities, and residence halls by combining a primary route passing through the center of facility complexes and secondary paths leading to individual buildings.

In designating the walks for the lighted pathway system, we have considered the larger circulation contexts that included the disabled, bicycle traffic, and vehicle traffic. The lighted pathway travels along roads where possible, avoids long stretches of isolated areas, and attempts to maintain visibility by avoiding dense trees and shrubs. Once designated, we then began a program of improving the light levels along the walks. This work began in the mid-eighties and is still continuing.

Our lighting design is based on the lighting standards promulgated by the Illuminating Engineering Society (ES). Their light level requirements for walks, roads, parking lots and bicycle lanes serve as the starting point for our lighting designs. We place particular emphasis on the ES standards for uniformity ratios. These are ratios that establish the relationship between the minimum light level and the average light level. We believe that uniformity is the key to successful lighting since the human eye's response to variations in light is limited. In developing lighting plans, we also ensure that vertical illumination is achieved so that an individual's face is clearly visible. Finally, we make efforts to reduce glare. Glare temporarily blinds people and is, therefore, counter productive.

The aesthetics regarding exterior lighting at the University of Virginia is a significant factor in determining the implementation of a comprehensive plan. We are interested in the appearance of the fixtures themselves, the uniformity of placement from an aesthetic as well as functional viewpoint, and the ambiance of the light. For instance, in the historic district known as Thomas Jefferson's "Academical Village", exterior lighting is treated quite differently than in other areas of the University grounds. A more ornate, traditionally designed fixture is used, placed so as not to distract from Mr. Jefferson's architectural vision, and with relatively low watt incandescent lamps to provide a softer level of light. In most other areas of the grounds we use an attractive, yet more affordable fixture, spaced to provide uniformity and functionality of light levels, with more energy efficient lamps. This fixture has the same general appearance as the traditional fixture.

We have developed lighting standards which are published in the "Facilities Design and Construction Guidelines" describing the acceptable fixture type for each precinct and the installation guidelines. Although we still have a variety of fixture types from over the years, the vast majority are in accordance with the program standards. In special situations, we will also use other fixtures if we feel they are more appropriate. At the school of Architecture, for example, we have used bollard lights along a short walk section.

Economic factors include both the initial installation costs and long term operating costs. As stated in the previous paragraph we have struck a balance between the use of the more expensive fixture versus that for the inexpensive fixture. We have also adopted the shoe box fixture for use on roads and in parking lots. The three standard fixtures reduce the size of our parts inventories and often facilitates bulk purchases. For operating costs we have moved away from incandescent and mercury vapor lamps to the more efficient metal halide lamps. While these are not as efficient as high and low pressure sodium vapor lamps, they have increased the light output of our fixtures, reduced our energy consumption, and maintained the light color preferred by the University.

Dark sky factors have led us to adopt cutoff optics for all exterior light fixtures with the exception of the fixtures in our historic district. The cut off optics minimizes light pollution which reduces night time effectiveness of our telescopes. This is of particular importance to our astronomy department as our Fan Mountain Observatory has the darkest sky of any observatory on the east coast. The use of cutoff optics in our standard walk fixtures has led to an increase in lighting costs. Since their light output has been reduced, we have had to place fixtures closer together to maintain light levels. The University willingly supports this moderate additional cost since we can not justify pursuing a lighting policy that hinders one of our research efforts.

The final factor is the requirements of our historic district. We are concerned with both day time appearances, and night time light levels and color. We have opted for low, but uniform

light levels with incandescent lamps. As with the dark sky issues, this has led to higher costs, but we believe these costs are justified since our historic district is a World Heritage Site. This places it in the same category as such noted landmarks as the Taj Mahal and the Pyramids.

Landscape, Design, and Maintenance

The attention to the design and maintenance of landscape plantings is instrumental for a safe campus environment. Plantings must be designed with the concept of surveillance in mind. Lighting plans and planting plans must also be coordinated. Just as a light fixture should not be installed right beside an existing tree, new tree and shrub plantings should be planned with regard to the future impact on existing lighting. It is not uncommon to see shrubs planted that cast shadows on steps. Fast growing trees planted near light poles will soon block the fixture. Large shrubs planted near walkways, even if they don't block light, can provide potential hiding places, compromising the feeling of safety.

We vary our landscape treatments depending on the location and character of the space. More intensely landscaped areas tend to be clustered around building entrances that have higher light levels and concentrated pedestrian traffic. As one moves away from building entrances the landscapes tend to become one of trees and grass.

For new planting plans we tend to set plantings of tall shrubs and flowering trees away from walks and parking lots. In their place we will use combination of shade trees, lawns, ground cover plantings, or low growing shrubs. For our purposes we consider a shrub with a height of 2 to 3 feet is low growing. Some safety guidelines prefer 18 inches to 2 feet.

For the rehabilitation of existing plantings, we have found that the removal of existing trees and shrubs can actually enhance aesthetics while improving safety. Through our removals we have revealed building porticos, and attractive stone entrance stairs. In other cases, the removal of tall shrubs has not even been noticed. We have found that input from the university community can be very helpful in these cases. Sometimes our intentions went against student wishes. At the School of Architecture we were set to remove a hedge of seven feet tall forsythia adjacent to a parking lot and the women students in the program stopped us. They said that they really liked the hedge and that it did not constitute a safety hazard. It was so thick and tangled that no one could hide in it. We ended up installing the light which we had planned on adding and left the hedge.

Landscape maintenance can add to the actual and perceived levels of grounds safety by keeping plantings in check. Certainly trees and shrubs should be trimmed and pruned to reduce light blockage and shadows. An effective measure for the University of Virginia in identifying areas needing attention has been a biannual "night light tour". Members of the Security and General Safety Committee, student group leaders, University Police, and grounds maintenance supervisors conduct evening tours twice a year to identify areas of concern and suggest corrective measures. This has been a positive activity, not only in improving identified items of concern, but as a means of continuous dialogue between students and administration on an important topic.

Lighting Maintenance

An exterior lighting program is only effective if it is properly maintained and operated. There must be a reliable source of power, an inspection and lamp replacement program, and an appropriate control system. Most organizations use a preventive maintenance program to schedule electric panel inspections and lamp replacements. Most exterior lighting systems are controlled through photocells, again requiring maintenance attention.

Funding Projects

One of the more difficult aspects of a grounds improvement program is obtaining adequate funding. All too often it takes an unfortunate incident to elevate the priority of grounds safety improvements. We believe two approaches taken at the University of Virginia have been beneficial in maintaining momentum. First, the development of a comprehensive program, with contributions from a wide segment of the university community has helped visibility and cooperation. It is not a facilities management issue, but an institutional issue. In fact, while Facilities Management manages the account that primarily funds safety improvements, the projects are identified and prioritized, within the available funds, by the University Security and General Safety Committee. Secondly, we seek multiple sources of funds for our projects in order to stretch our limited safety improvements budget. Examples of past contributors include auxiliaries, capital projects, private donors, student groups, and other university local accounts.

Conclusion

A good design strategy for a safe campus environment is one that strikes a balance between planning, aesthetics, economics, and safety factors. Safety standards cannot be blindly applied as rigid guidelines, but must be viewed as dynamic guidelines which respond to aesthetic as well as functional goals.

A good safety program is one that takes the design strategy, and implements it through involvement, education, and maintenance. Our campus safety program at the University of Virginia has evolved and improved over the past decade as a result of these elements. While it is true that the expertise of our in-house technical staff has improved over this period, it is also true that the depth and extent of our program has improved by being inclusive. It has been and continues to be a process open and receptive to both differing viewpoints and interests and to new ideas and approaches. By actively seeking input from students, faculty, and staff our facilities staff and campus planners have been able to develop an open forum for a program of grounds improvements for a safe campus environment.

The Particle Method: A New Approach To Campus Planning

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The Particle Method is a breakthrough advance in the procedure of land analysis and design. Every project to evaluate and plan a site adheres to a process, a program of steps, or tasks. Process is paramount because planning is problem-driven. Rarely is land the wellspring of pure inspiration, as in other arts. Typically, instead, we confront a "context of complexity" that forces a tight focus on problems and solutions. Everything depends on the clarity with which problems are identified. The point at which a problem is most fully understood marks the threshold of design. But where the process is flawed, problems may occur beyond its reach, diminishing the fitness and relevance of designs that follow.

Planning's central challenge has always been that of communication, and the medium of the message is land. Inevitably the language of planning involves the presence of land and how it is represented, in maps, images, and other descriptions. Land is the instrument through which planning is "spoken." But how are conditions of a site to be translated in terms others can understand? What are the means of portrayal that generate a picture which is clear and meaningful?

Industrial societies make the challenge all the more burdensome because planning must interpret, and reflect, their complexity. Meanwhile the sheer cost of implementation — earthmoving, construction — makes clearness of intent a matter of equal importance. This division of purpose, between clarity and comprehensiveness, nettles the profession in ways that have never troubled architecture, for example, whose conventions of the building plan and section have nourished it for centuries. In the absence of any universally recognized device or procedure for communicating ideas, planning labors along with one strategem of mapping or another. But as the pace of discovery in the social and behavioral sciences continues to advance, churning out more information about every dimension of modern life, planners everywhere, on whatever the project, seem to feel honor-bound to collect it all. Then they "share it" with their clients, in diagrams of every description, a procession of images as interminable as a May Day parade.

It is a process that leaves no one particularly satisfied. Clients, who are asked to accept it all on faith, have little recourse to verify what they've been told. As often as not, considering the cost, they incline to scale back site research, or else forgo it altogether, favoring attention to "objectives" or "alternatives" — anything to urge the process along. As for the consultants, having cobbled together their own approaches, they often make the pleasing discovery that their abundant organizational skills can be channeled into methods they then claim as their own. Land analysis, to that extent, has all but become a matter of personal style, in which every practitioner,

long before design is at issue, puts his or her "signature" on what should otherwise be standard procedure. But next to the search for some definitive method of site research, this is land analysis as sideshow, complete with juggling acts, sword-swallowing, and other feats that may indeed amaze, but which also confuse and confound.

For colleges and universities, as opposed to, say, municipalities, the need for reliable site research is made more acute by the fact that the stakes are arguably higher. Competition among schools — for government aid, grants, gifts, teachers, and students — has never been more keen, and it appears that the campus itself, the physical plant, commands an ever larger role. Real estate transactions, locational decisions over new construction, and other aspects of the capital improvements process are not the whole story. It is how the campus performs as a community, the "little world" it makes as a social and visual setting, that confirms its emerging significance. Now a fully recognized recruiting tool, the campus is not only a school's biggest investment, it has also acquired a public face which, in some cases, comes literally with the trappings of celebrity. The garbled messages some campuses project about tradition, the nature of learning, the role of research, community relations, and safety and security can no longer be papered over by correographed photos in the promotional catalogs. School administrators everywhere now acknowledge the connection between protecting their investment and the role played by sound planning, design — and site research.

Characteristics Of The Method

The intent of the Particle Method, as it concerns colleges and universities, is to pry open the planning process and hold it more accountable, that is, with fewer surprises, for what it tells us about the quality of campus settings. The method restructures the field of inquiry that propels the process. It suggests that the built environment — buildings, grounds, roads — isn't reducible to a roster of loosely related "systems." Its attributes are in fact readily observable in the context of a normal day. The task is to fashion a more transparent graphic framework. The method establishes a representational program which, like sheet music, can be "read" and interpreted by anyone. Here are characteristics of the method that set it apart from conventional practice:

Simplification and Focus

The method repositions the approach to observing and considering the environment by directing information along new, more efficient channels. Eliminated is much of the clutter and overlap of current procedure. The "land-use" diagram, for example, the old mainstay, is discarded altogether. This is because, while it purports to "say" a lot, its messages are nearly unintelligible. A building showing "retail" as a use conveys little about how it is used, to what degree, or how the building relates to its vicinity. The new method accounts for all that, and more.

The method redirects the focus of site research from causes to effects. It departs from conventional reliance on internal systems and subterranean influences long considered to be the "real story" behind a site's appearance and operation. Taking note of a stand of trees, for instance, current practice would call for launching perhaps a dozen investigations — soils, topography, ecology, geology, climate, ownership, zoning, municipal jurisdictions, park systems, local

history — anything that might possibly account for trees at that location. The new method asks simply, instead, What do the trees contribute to the setting in which they occur? Emphasis on what is plainly evident from direct experience effectively reconstitutes the process, stripping away much of the overgrowth of forty years of procedural tinkering.

Representation

The method implements a graphically significant formulation of the built environment as it exists. It advances a graphic code that directly correlates experience — a symbolic translation of actual circumstances. The method works toward a language that not only serves as a referent to real conditions, but which is also the premise for “talking through” strengths and weaknesses of a site by clients and other stakeholders. From building to building, block to block, the procedure registers only those features that bear on how the setting is “received,” that is, seen and used. Experience, in this way, is an expression of various systems — infrastructure, climate, politics — that may (or may not) account for it. As a product the method operates both in summary and detail, rather like the zoom and pan feature on computer graphic programs. Recorded details, in aggregate, fulfill the supposition of what we know to be true intuitively: impressions are summarizing “estimations” of clusters of discrete features.

In this way the method achieves remarkable correspondence among areas or spaces having no other apparent connection than proximity. A cherished landmark with strong visual content and layered symbolism can be rendered as convincingly as a grimy, trash-strewn alleyway next to it. Juxtaposing their attributes is important because the two spaces co-exist in real terms. Under conventional practice, by contrast, they would be shown to be worlds apart. The landmark would be consigned to a “landmarks” or “positive features” diagram, while the alleyway would find itself positioned, disconsolately, on a “problems” panel. The new method’s sweeping integration of a spectrum of features, under a single representational regime, overcomes much of the abstraction inherent in the products of current procedure.

Transparency

The method aims for measurable explicitness, a “screen” through which the built environment is translated graphically but is nonetheless apparent and accessible. This factor of precision is demonstrated three ways. One is precision by type. The method shows how the appearance and function of a space or sequence is a synthesis of constituent “parts.” These parts compose the various “effects” forming the compositional whole. A particular stretch of a city street, for example, is found to contain dwellings, a church, a sidewalk cafe, street vendors, a vest pocket park with mature trees, and a parking garage. Measurable effects of such features include volume of vehicular traffic, parking volume, movement on foot and other activity among houses and retail outlets, architectural distinction, tree canopies, and considerations of the street as a visual ensemble. All are feature types and subtypes within broad categories of effects.

Precision is also expressed by location. The method demonstrates that every feature — a specimen tree, tot lot, corner bar, a parade route, even commonly held “feelings” about a particular place — registers location and range. This marks another departure from current practice, which typically perceives the environment in terms of broad swaths, arrows, and “bubbles” of impossibly uniform characteristics stretching across “districts” or “precincts.” The problem

stems, in part, from a misapprehension of scale. Conventional site research is commonly conducted at 100th or 200th scale (100 or 200 feet to the inch), out of the apparent belief that anything larger (say, 50 feet to the inch) would force planners to consider more detail than they have time (or patience) for. Moreover, most campus districts measure a half-mile or more in one direction or another. At 50th scale, a plan map running 50 to 60 inches in one or the other dimension will drape over the sides of most drafting tables, and will exceed the capacities of most computer plotters. But planners' aversion to detail is in fact beside the point. Readability, the usefulness of plan diagrams, in other words, is not tied to scale, but is a function of graphic precision, regardless of scale. Advances in reprographic and computer imaging technology in fact make the issue of scale moot. The new method shows how fully readable diagrams can be produced at scales of 200, 400, 800 — even 1,000 — feet to the inch.

Finally, precision operates by role. The method suggests that environmental features display themselves in terms of how they "contribute" to a composition. Their capacity as effects is measured by intensity or significance. "Role," therefore, is an expression of prominence (see "Value," below). Roles played by various features are relational: they visibly add to, or subtract from, the composite impact of the whole. This "simultaneity" of experience finds expression in the graphic indication of loading symbols literally on top of one another. Pedestrian penetration of a row of shops, for example, might show sidewalk movement, groups in casual conversation, browsing, window shopping, "hanging out," and so on. The intended sense of the summary effect is delivered in the same way we receive it. The retail strip we witness is correlated similarly on paper: the diagram is visibly just as "busy." The difference is that we are provided the constituent precision; our grasp of the roles played by each effect activates the portrayal in measurable terms, and makes it useful.

Typology

The method suggests that the built environment is more than an aimless arrangement of streets and structures that people "use" almost unconsciously. On the contrary, it is an accessible "world" that, for the most part, is lived, and relived, on well-worn tracks of experience. The environment is a measurable field of sequences — chains of spaces that consolidate experience in strings. A "space" is an envelope, "enclosed" by buildings and the sky, through which we move from one to the next. Were it not for this fundamental, reassuring structure, a trip to the store would be so disorienting as to be impossible. Like the rooms of a house, spaces are of varying types and functions. Their typology, from one to the next, reveals itself in terms of values of intensity and significance exhibited by various kinds of features and effects (see the section "How the Method Works"). The quality or character of a space is determined not only by broad performance, but by how it conforms to type. No one expects, for example, a quiet residential street — even a socially active campus green — to perform in the same manner as, say, Times Square in New York City. By the same token, however, even the most active public spaces are subject to ebbs and flows by time of day and season. Times Square before sunrise on a weekday manages to have none of the liveliness everyone associates with it. It "adopts," instead, if only briefly, the vacant repose of a residential enclave. This "transposition of experience," in which attributes within one type partake, and invite comparisons, of other types, is one of the richest yet largely unexplored avenues of research for environmental design. The determination and ma-

nipulation of spatial types is perhaps the most useful work coming out of site research that leads to plans and designs.

Value

The method introduces the notion of value scale by establishing a graphic code for portraying assessments of quality. The premise stems from the recognition that there are hierarchies of evaluations about the built environment that are widely acknowledged, if not openly subscribed to, by broad cross-sections of society. This substantiates a more verifiable approach to normative positions toward environmental improvement taken by planners and designers today. A well-run campus, for example, might be judged to be easily accessible, by foot or other modes of transport. It follows that greater efficiency of access is to be more highly valued than lesser efficiency. "Efficiency" can be measured by such factors as energy usage, land consumption, and numbers of people transported by unit of time. In this way, a commuter train has greater impact (efficiency) than do cars. What the method does is to make that determination manifest in visible, graphic terms.

Value is nothing new to planning and design. What is without precedent is how the method makes it explicit. Practitioners have many reasons to like conventional approaches to site research, not the least of which is to place land analysis under a kind of veil of confidentiality. Because clients are largely unable to verify what has been found, practitioners are rarely accountable for the value judgments they make about "existing conditions." This has the effect of placing the whole process under a representational fog, from which some plans frankly never emerge. The new method, by contrast, throws the process wide open to scrutiny by anyone, which is as it should be.

Perhaps the most useful application of the principle of value lies in how the method portrays "problem scale." Under current procedure, the distinction is nearly always drawn between "problems" and "opportunities." But in fact in most cases problems are opportunities, and vice versa. Even the convention of "positive and negative features" is problematic because positive features invariably highlight problems, while negative elements always point the way to design. It is this haziness of definition that sorely undercuts the normative foundations of conventional practice. What is missing are the inevitable fluctuations of value; which is to say, problems have scale, too. Problems reveal themselves by the erosion or absence of value, not by tagging them with flares. Problems come not in units, like canned goods; they are, instead, gradations of value found to be at variance with standards or norms. This shifts the entire process to a new plane on which planners and clients bring problems, policies, plans, and resources toward a core effort of analysis and assessment — not the linear, stutter-step path typically taken under current procedure.

Process

The method answers the long-standing need for greater continuity between analysis and design. Site analysis has for years been undertaken as a bracketed, nearly separate effort, offering only tenuous connections with creating solutions. This is because there is no believable means of portraying assessments in terms that have any quantifiable link to design. Far from the need to edify clients, planners typically view analysis as the means to gain some grasp of what's there

for themselves. But this only makes dreamwork of the search for solutions — as aimless and open-ended as an architect's doodle.

The method also reorders the larger process of how a land planning project is typically carried out. The traditional establishment of "goals and objectives" that always figures early on in a project is, under the new method, nearly pointless. This is in recognition of the fact of how difficult it is for people to know what they want unless they know what they have. Moreover, how can useful, cost-effective solutions be substantiated in the absence of a clear picture that demonstrates areas of strength and significance, as well as convincing evidence of spaces that falter under the impact of various problems?

The method shows how vital site research is to the entire process. In a sense, it becomes the centerpoint, the nucleus, where objectives spring directly from problems, where solutions are more nearly the "resolution" of strengths and weaknesses of an area targeted for assessment. For colleges and universities, this can mean a windfall of savings for the whole effort at campus improvement. It also means a procedure that effectively returns the process to the hands of those who stand to benefit most — the schools themselves.

How The Method Works

The Particle Method attempts to redefine some of the salient issues that shaped the so-called "rational model" of environmental design. Land analysis procedures growing out of the model have been in force for four decades or more, and are long overdue for reassessment. The new method attempts to file down a procedure encrusted with overuse, and start fresh with a fundamentally new structure.

The reasoning proceeds from the assertion that the built environment, from city centers to rural villages, isn't the chaotic "soup" it is widely regarded to be. Human settlements exhibit, instead, remarkable visual congruence. Even accounting for authenticating distinctions, there is a prevailing structural unity among places which enables us, at the very least, to "find our way" from one location to another. More significantly, settlements contain many features or "particles" that are locationally discrete and varyingly related. Individually, they lower the focus of research to the level of site detail, as indicated, for example, by shop signs, park benches, a planting bed, or memorial. Features in aggregation show "traits" that inform our sense or response to a particular setting. Responses take several forms but are intended to be measurable. As human reactions to external stimuli, receptions by individuals and groups are crucial to the method because it is rooted in experience, not the disengagement from experience. The site itself is the measurement field, not the systems that are in support of it. Systems find expression in the site, not the reverse.

There is a representational language that enables any setting to be read as a "field of relative significance." Particles are depicted by abstract symbols associated not only by type but also by value. Value, as noted earlier, is an expression of significance of a feature within its type and locational context. The assignment of value occurs on the basis of criteria for each type and by the admission of a design ideal. This is to say that the method assumes, correctly, that there are broad estimations of environmental design value held in common in any community, by which there are spaces and settings held in favor and those that are not. The method acknowledges an evaluative, qualifying impulse that nearly everyone engages in, consciously or not. The propensity to assign value is, for all intents and purposes, universal. The method regards this as a per-

fectly normal activity, but more important, that it is crucial to our understanding of the environment and how we go about making improvements. Rather than to dismiss the impulse as an intrusion on subjectivity, the method codifies it.

Features and feature ensembles are entered on diagrams which are base drawings that display a site as an extended architectural plan. Buildings are not "footprints," but are shown in plan because, with the exception of residences, there is "public claim" on most internal spaces. Trees are, in effect, columns, and read as dots, and so on. The point is to create a base "layer" of site information that serves principally as a set of locational "prompts" for the loading of symbols. Feature symbols are entered onto diagrams by location and range. They should be scaled to the typical condition they relate to. The intent is for locational precision as to where a feature occurs or is typically viewed or sensed. Particle value is shown by the tonal intensity of each symbol (0 - 100%), which reflects the quantitative registration of value on a scale of 0 to 1 (in hundredths). (See "Procedure for Campuses.")

Particles are aggregated into three fundamental tracks of significance, or "patterns." Each pattern consists of from two to four subpatterns, for a total of eight. The three basic patterns are transport, social, and sensory. "Social" relates the movement on foot and other behavior of people in visibly public settings. "Sensory" concerns all the visual and associative effects the environment projects by way of the arrangement and articulation of buildings, vegetation, cultural effects, and public symbols. "Transport" concerns the movement, by vehicles and other conveyances, of goods and people. Each pattern is assigned a color, and all the feature types within the pattern occur, in varying tonal intensity, in that color. Sites under research are therefore visual-functional fields that accommodate the three patterns.

What emerges is an abundantly useful pictographic image of the environment in quantitative terms. Patterns, both in sweep and detail, reveal a site to contain certain essential factors or features that leverage our associations of quality from place to place. Across the eight sub-pattern diagrams is an item-by-item inventory of the full complement of elements constituting the environment.

As tools for analysis, the patterns amplify their benefits when viewed in combination. Pairing transport and social patterns, for example, highlights pedestrian-vehicular "conflicts," and clarifies the entire transport-pedestrian system by which a site is accessed. Overlaying transport and sensory patterns demonstrates the impact the transportation system has on the visual environment. Joining social and sensory patterns relates the ways in which there is correspondence between behavior and visual content.

Even more instructive is consolidating the three patterns in a treble, composite image. The fluent variations of significance, as we work across the site and along the three data streams, discloses an environmental tableau which, once the language becomes familiar, bears remarkable likeness to the one we experience. Its distinction, however, is that it transmutes experience into terms that are at the same time qualitative (graphic) and digital, making it an immensely effective planning tool.

We might note, for example, from an "Activity Venues" sub-pattern diagram (see "Procedure for Campuses"), that a small sitting plaza exhibits a high variety of peak-hour behavior — sitting and watching, sunning, reading, eating, talking in groups, walking through, and the like. But turning to the composite inventory, however, we find that, despite its behavioral "range," the park achieves only moderate levels of use intensity, at, say .4 or .5, relative to its scale and location. What this tells us is that while the park is "popular," it might be more so under favorable

conditions. A scan of the vicinity, in diagram, with a check of the surrounding social network — the proximity of housing, workplaces, shops, transit access points, and so on, along with the register of visual significance — will suggest some answers.

Does the park's limited social presence constitute a "problem"? Not necessarily — certainly not to the extent that a perpetually empty one does — and "dead plazas," on campuses and in cities across the country, are notoriously common. But we begin to see how elusive problem formation can be, particularly under the rather ham-handed approach of conventional practice. Problems, in the most useful sense, are rarely glaring or obvious. More nearly they are subtle connections of discrepancies, deviations, areas of weakness, signals of decline.

This is how the method achieves its unique potential. The composite image, a field of usefully articulated data, charts the course from analysis to design. From one to the other, there is always a crossover point. The method reduces it to nearly a pivot.

Every setting contains a "structure" that correlates its visual and functional properties. Structure, in that sense, has little to do with buildings or street grids. Instead it concerns the search for clues to the outlines of a form that will constitute the source points for solutions. Again, we are confronted with the human propensity to organize experience into believable (mnemonic) sequences, identifiable containers of space. To build on that is to see how the environment is forever furnishing cues to advance its "legibility," its capacity to be understood and enjoyed. The function of environmental design emerges from just that sense: the search for a visual-functional "framework" to which structural "components" may be added or deleted.

The notion of framework recalls the "conceptual sketch" widely used by planners and designers at the point of working out "design alternatives." Under the new method there is the parallel and often useful procedure of distilling the composite inventory to an abbreviated "framework," composed of those elements determined to be the most essential components of a visual-functional structure. The same three patterns occur, in phase, but in a tonally reduced format that sets the stage for the coming framework in design (see "The Method at Rutgers"). In contrast to conventional practice, which all but abandons "existing conditions" in a creative frenzy, the new method finds solutions inherent in, or implied by, the conditions themselves. Under current procedure, one works from the top down, devising schemes that may or may not relate to what is below, usually issued with the disclaimer that the details can be "worked out later." The new method works the other way, from the bottom up, with solutions that "emerge" from a locationally correct and appropriately scaled representation of reality.

Composite inventory further suggests the existence of an environmental model that organizes the full spectrum of types of spaces into a single conception. Every space — a campus "gateway," a park path, a segment of a city block — demonstrates a verifiable level of intensity or significance along the three pattern parameters. These values can be plotted on a 3-axis graph in which the x, y, and z coordinates reveal a three-dimensional grid that relates the patterns simultaneously. The model shows how parameter values gather into identifiable spatial types. A space showing low transport values and negligible social impact is in all likelihood a suburban residential street, with a varying array of sub-types along the sensory axis indicating different levels of visual presence. A high transport space with no social value and low sensory figures is an urban freeway. A low transport space with high social numbers but low sensory figures might be an active residential-commercial strip in a poorer city district. And so on.

The model suggests that spaces making up the built environment, far from representing infinite variety, are more probably a discrete number, a fixed set. Individual spaces, for all their idi-

osyncratic distinctions, seem to coalesce along node points across the model structure. In this way the process moves from open-ended explorations on the basis of limited information to one in which there is substantive clarity as to spatial type. The process can perk along more efficiently, on more clearly defined channels, and at a savings of time and money.

For example, a street bordering a campus may denote "boulevard" along one or two blocks (spatial units), then "deviate" in a subsequent block to an extent that lifts it out of one type category and into another. Parameter values could in fact be plotted on a graph that would show the street's "peaks and valleys" — its relative conformance to type, block by block. Significant value dips or declines will be signals for closer investigation and possible design treatment.

All spatial types may be said to exhibit "tolerance." Their manifestations move along a range of parameter values. Adherence to range means that a sequence, a string of spaces, stays "within tolerance" — that is, maintains its fundamental character.

From either perspective, that of typology or composite inventory, the method shows how the nature of environmental design, and the design process, can profitably shift to new channels of inquiry and decision-making that are more efficient and cost-effective. Environmental change, from major capital improvements to relandscaping a lawn, is expensive. Even more so, in relative terms, is the cost of planning. Fees by established firms for a major campus master plan now range into six figures, with as much as half that amount going to inventory, the so-called "survey of existing conditions." School administrators may wince at the thought of underwriting a procedure that amounts to little more than an exorbitant "learning curve" for the consultant — only to face the same hurdle five to ten years later when the time comes for a master plan "update" or "overhaul," usually under a new consultant. What better incentive do schools have than to bypass those fees, spending instead only a fraction of them on building their own campus inventories? The new method demonstrates a practical approach to doing just that, under procedures providing a secure footing with measurable indices of social content, visual quality, and function.

But the real cost value of the method lies not only in the savings derived from avoiding the stop-start inefficiencies of the present process, it comes by way of liberating schools from a "confinement of fear" about the implications of planning. Administrators often resist the whole notion of campus planning because it seems vague and insubstantial. Better to "spruce up what we have," one can hear them saying, rather than to commit dangerous sums to alterations and additions that can only make the campus community nervous and whose long-term benefits are unknown.

This institutional inertia accounts for much of the functional incoherence and palpable blandness that afflicts many campuses across the country, although there is little adverse effect on big-ticket items in the capital improvements process. Buildings continue to be built in great numbers. Besides their obvious provision of space for all that schools must do, buildings under construction are unrivaled tokens of "growth," and growth, it seems, is what everyone, from donors to parents to town councils, likes to see. But whether construction cranes denote substantive improvements in campus legibility and image, tighter integration with the surrounding community, and maturation as a seat of learning and research, are other matters altogether. To the extent that these, as objectives, legitimize a planning process, they are the very issues many administrators would just as soon leave to their successors.

But because the new method opens the process to wider participation and greater scrutiny, under a system of portrayal that levels the playing field between consultant and client, other col-

lege officials may see clear to take a fresh look at campus planning altogether. At the very least, with a better grip on costs and accountability, many will see the benefits of a stronger relationship between the directions and principles coming out of analysis and the built results of design.

This predictive dimension finds its best expression in creating design "alternatives." Under the new method alternatives mean something other than what they are now. Conventional practice makes a showcase of alternatives, in which heroic, site-wide "schemes" promising to overhaul the environment and "solve everything at once" are displayed with bold, eye-catching gestures. Alternatives under the new method, by contrast, become predictive "testing procedures," in which costs and benefits, in functional and esthetic terms, are plotted in the same manner as the composite inventory, using reasonable estimations of impact across the three patterns. Proposals for, say, a building addition, parking deck, or new sitting terrace can be surgically "implanted" in the composite diagram, in order that their summary effects, both in detail and coincidence, can be reviewed critically and usefully. The net effect is a process in which there is broader power of ownership spanning the competing perspectives of planners and clients.

Above all, the method can be expected to have a leavening effect on the whole enterprise of campus improvements. Architects, knowing that their building proposals will undergo such rigorous contextual testing, will be more inclined to take greater care with their designs' functional friendliness, social "grain," and treatment of facades in terms of how they "meet the street." A building will become less an addition to the architect's personal oeuvre than what it should be: a formal addition to a public setting. The placement of every tree, woody shrub, and planting bed — not to mention the entire interstitial network of walkways, plazas, terraces, amphitheatres, gardens, groves, lighting, and signage — will undergo a similar conceptual shift. Nurseries contracted to "landscape the new dorm" will know that their compositional decisions, on conclusive evidence, will be held to new standards of performance. Even on-campus landscape and planning offices will become more circumspect, observing the strictures of a process under which every detail adds, or, quite conspicuously, detracts.

Theoretical Basis

In his last book, *Good City Form*, published in 1981, the great MIT theorist and teacher Kevin Lynch, looking back over a century of advances in the theory and practice of planning, lamented that the profession had developed no convincing method of representation: "The study of cities has no powerful basic language of its own.... It once seemed reasonable to me that a single standard language for settlement patterns could be developed. But preparing such a description proved to be very time-consuming.... when faced with a particular problem of analysis or design, one falls back on some other specialized language, usually a rather conventional one."¹

Lynch may have chafed in the absence of any widely accepted means of communication, but took it for granted, like the rest of his profession, that the rational, scientific premise of planning, after two centuries of development, was irrefutable. Nevertheless, new modes of description and representation were central to what distinguished the modern city — after, say, 1800 — from its medieval antecedents. Modern planning rose out the need for strategies to counteract the side effects of the Industrial Revolution, including pollution, overcrowding, traffic congestion, public health crises, and visual degradation. Planning literally sprung from the first great surge in the growth of London, which doubled in size from 2 to 4 million people, between 1830 and 1900. Other European and American cities staged similar patterns of growth during this pe-

riod. The first comprehensive urban master plan in the modern idiom was Baron Haussmann's transformation of Paris. As Prefect of the Seine between 1853 to 1870, Haussmann set out to do nothing less than refashion a largely medieval city into a modern metropolis. His strategies to improve circulation by accelerating traffic flow and to "ventilate" the city by carving out new areas of green space were carried out under bold new methods of observation, mapping, organizing data, and predictive measures to chart a course for Paris's future.

With some irony, Haussmann's analytical prowess is overshadowed by his plans, which were, for his time, rather conventionally Neoclassical. The boulevards, promenades, parks, and plazas he laid out are what we remember, and still see, today. But his underlying methods and principles, particularly his notions about respirating the city with open space, nourished a spirit of urban reform on both sides of the Atlantic. Frederick Law Olmstead's 1857 plan for New York's Central Park and Daniel Burnham's 1909 plan for Chicago, with its green belt park system, both drew inspiration from Haussmann. These and hundreds of other park and boulevard system plans across the country constituted the City Beautiful Movement, whose impact is still felt by the structural "signature" such plans provide many American cities including Boston, Philadelphia, Cleveland, San Francisco, Kansas City, and Minneapolis.

But all that changed with the rise of Modernism. The mincing pace of social and urban reform was effectively crushed under the intellectual and artistic combine that swept out of Europe after World War I. The Modern Movement viewed society, with its hidebound strictures of wealth and status, as insensitive and oppressive. Modernism envisioned a new social order promising increasing equality and opportunity, which called for a new architecture of clean lines, sleek planes, and simple geometries unadorned by historicist bric-a-brac. Buildings were no longer expressions of civility and the public realm but were rational "products" of scientific analysis of their internal and structural functions.

No arena of life escaped the Modernist influence — least of all cities themselves. Viewed no longer as organisms with "lungs" and "arteries," cities were seen as machines that could be taken apart and, under the new science of sociology, made knowable. The institutional optimism and esthetic determinism that made Modernism a style — the International Style — proved so intoxicating to architects that there are few cities anywhere that do not bear the stamp of its monotonous, boxy esthetic. Similarly inspired master planners drew up visions of sprawling urban complexes sharply segregated by use, and made accessible only by freeways.

Modernism's failure was the very hubris that propelled it. This was made no more apparent than by its sorrowful record in American public housing, symbolized by the razing of the award-winning Pruitt-Igoe housing project in St. Louis in 1972. Yet the Movement's failures now seem almost incidental to the spirit of rationalism and scientific inquiry that, today, structures the operation of every planning agency in the world.

Before World War II, the effort to rationalize the study of cities expanded under the recognition that they were indeed complex entities with many levels of function. Operations research, a set of methods to organize information that prefigured the computer, was developed to try to predict outcomes for complex operations in industry, the military, and government. One focus of operations research was to develop process models serving as guides for decision-making. Their application to cities rested with the need for a standard set of procedures for site research, targeting problems, and devising solutions or plans. Design models were put forward and argued over all during the century, but it was not until 1955, when it was clearly described by Edward Banfield in the appendix to a book on public housing in Chicago that the model was established as a

professional standard.² Its discrete steps of analysis, setting of goals, design, and choice among alternatives are the touchpoints of what has become the rational planning model.

While observing the fundamental good sense of the model's rational premise, the Particle Method demonstrates how the model fails to establish a useful association with the real world. The method, by contrast, takes as its proposition an integrative stance toward real conditions.

It does so on under two key principles, one of which is context. After decades of research into every facet of human behavior, social and behavioral scientists now have dozens of theories to account for the operations of society and how we view the world. Nearly all of them require the extraction of variables viewed in isolation or under predetermined comparisons. To know how house values relate to ethnicity, for example, or how infrastructure affects development is all very interesting, but it adds little to our understanding of how the built environment, in specific instances, functions as a whole. As a basis for site research, such an approach leaves planners and designers with no alternative than to follow suit, which accounts for site analysis that compartmentalizes conditions into rationally discrete panels. Even recent developments into new techniques for critical observation, such as "simultaneous perception" advocated by Tony Hiss in his popular book *The Experience of Place*, falter under scrutiny. Because their descriptive procedures are essentially verbal (written), such methods fail to meet the requirements of integration and representation.

Under the Particle Method the process moves out of the lab, as it were, and into the froth of actual circumstances. In a very real sense the environment eludes the grasp of theory because there is no means of representation with which to snare it either.

Planners and designers are understandably driven into the arms of social scientists because their distillation of experience into systems or other abstracted relationships is a source of refuge from having to confront the conditions themselves. But to suggest that the aims of research have no practical relation to the conditions in which people live and work only subverts the process altogether.

This leads to the second principle representing a conceptual shift from the rational model, which is that of improvement. On what other conceivable basis is there to plan than to improve the quality of life? Planning's very reason for being came out of the need for measurement, to research and describe certain social problems. That has not changed. But its second function, prescription and design, has always put the profession at odds with the extrinsic demands of science — to place itself outside the process so as not to skew the results. Science's abstraction of experience into units and systems isn't the profession's only burden. Planning must also labor under the pretense of objectivity.

It should be self-evident, instead, that the process from start to finish is chockablock with values. Planning, unalterably, is a value-laden endeavor. Planners must not only find out what a site contains (measurement), but must also search out solutions and improvements (prescription). The question is, why encumber the process on the claim of being scientific in the first part, if the end result is to make judgments and prescriptions about quality?

The notion of betterment is founded on certain broad, irreducible goals of public life that most members of any society share. These can be shown to align with the three basic measurement patterns introduced earlier. For example, there is the broad objective of social coherence, which says that society strives toward a position of harmony of relationships among citizens. The method's social pattern is a means to measure social achievement, in those terms, on a given site.

Improvements in the physical composition of the environment naturally links with the sensory pattern, which comes under the broad goal of making human settlements more legible and attractive. And society's economic function, the distribution of goods and people, parallels the method's transport pattern, which carries the broad objective of efficiency. In order for society to further its other ends, it must operate under procedures that promote the conservation of resources.

Coherence, legibility, and efficiency, as parameters of quality, formulate an evaluative model not unlike architecture's ancient quality model, first advanced by Vitruvius in *The Ten Books on Architecture*. A building, he said, is gauged by three criteria — *utilitas*, *venustas*, and *firmitas*. "*Utilitas*" concerns the building's function, the qualities with which it serves its users or inhabitants. In similar fashion, the external spaces of the built environment may be evaluated in terms of how they operate in a social sense — the extent to which they promote coherence. "*Venustas*" is "delight," the way a building looks and feels as a place that enriches experience — a parameter with obvious parallels to the legibility of the public realm. And "*firmitas*," as Vitruvius's third criterion, concerns the building's structural and technical soundness, which for the built environment is another way of addressing its relative efficiency of movement.

What the Particle Method does is to bring empiricism back to the heart of the process, under the premise of evaluation. A representational program that organizes both context and value (improvement) simultaneously enables planning to do what it does best, which is to target problems, devise solutions, make predictions.

But is there a theoretical basis for value other than society's commonly shared goals? In all likelihood there is, as a result of research in cognitive psychology by Kevin Lynch and others following World War II. In perhaps the century's most influential treatise on planning, Lynch's *The Image of the City*, published in 1960, advanced the notion of a direct relationship between the visual structure of the environment and personal assessments of value. What Lynch saw was that people's native propensity to make legible sense of their surroundings was the basis for determining the functional soundness of the environment by way of the strength of its "image."

Lynch's research methods were decidedly simple. Respondents were asked literally to draw diagrams in which they recorded all they could recall about the districts or communities in which they lived. Based on evident congruity among respondents' maps, summary diagrams were created that organized images shared by various ethnic groups or residents of particular areas of a city under study. These "cognitive maps," as they came to be called, established in Lynch's view a simple language of visual structure which could represent the built environment by its basic constituent parts.

Cognitive mapping has since been a useful tool for research psychologists in advancing theories about perception and other mental processes. Its applications to planning have been comparatively limited, however, as a result of the fact that its methods are cumbersome and time-consuming. But in a single stroke Lynch substantiated the importance of accountability in design toward users and participants, as opposed to designers. By establishing the connection between memory and experience, he produced irrefutable proof that the environment shapes us equally as much as the reverse. But his link between image and reality, demonstrating how certain features advance in the memory while others recede, was the book's lasting contribution.

Cognitive structure, with which memory is a yardstick of value, is where the Particle Method works from as a point of departure. We come down to the question, What is memorable? What creates an image whose strength is sufficient to build an inventory of what we're

drawn to? Knowing there is the means to portray the swells and recesses of significance, we are provided a premise for value. Places that inhabit the mind are those that create an image of strength with regard to social interaction, visual structure, and resourcefulness of movement. As for those places that do not, quite literally and figuratively — in measurable, graphic terms, we draw a blank.

Procedure For Campuses

Colleges and universities wishing to build a particle inventory of their campuses will require, first, a detailed base drawing of the campus and vicinity as an architectural image. The document must have considerable precision as to line weight, location, and component relevance. Unlike most "base maps" that show buildings as "footprints," for example, a particle map depicts buildings as assemblages of walls, columns, and partitions. The architectural nature of the plan sets the rules for inclusion (and exclusion) of everything else. Trees, light standards, sign posts, and behavioral "affordances" — benches, mailboxes, and the like — are to be shown in plan in terms of how they meet the ground. Traditional elements not appearing are curb lines, topographic contours, names of streets and buildings, and other "distracting" information. The point of the drawing is visual clarity — a clean image that will "ground" all site data accurately by location.

Drawing scale is significant as to context. There should be a periphery of plan information that establishes the campus in some useful relationship to its vicinity. Criteria for determining context include access to transit stops, freeway interchanges, nearby town or commercial centers, parks, rivers, or other features that define the town or district.

Although some schools now have building layouts and other site information stockpiled in databases under AutoCAD or GIS computer programs, few have all relevant data organized in a single site document. For most schools the method of choice for creating a reliable base drawing will be what it has been for decades: ink on mylar. Most campus dimensions will accommodate drawing scales of 100th (100 feet to the inch) or larger. Subsequent pattern diagrams can be reduced to more manageable scales for presentation — 400th, 800th, and so on. Once complete, the base drawing should be reproduced in a fine screen tone (say 40%) or in a solid grey scale color — a light cool grey. This is because base information should not compete visually with pattern data.

The chief recording device for assembling and storing raw data is the camcorder, although its benefits can be usefully replicated by observation, with counts and other notations made on base map copies. The camcorder, however, is a ready repository of information — social activity, traffic counts — which may require verifying later. It can also serve as a "visual record" for archival purposes, as well as to determine significance values for many sensory pattern components. The same footage may be used, as necessary, for selected interviews, focus group surveys, and other techniques for significance verification.

Once all raw data is on tape or in some other form, work begins on "loading" the pattern diagrams and assembling an inventory "catalog." The catalog is an item-by-item listing of every relevant "particle" (feature or effect) the site exhibits across the eight subsidiary patterns.

A useful approach to formatting the catalog is to arrange a multi-column matrix that distributes each item not only by pattern but also by spatial unit. Determining units may be by the

block or half-block and by building groups that enclose a spatial segment of the campus. Catalog entries appear this way:

4.01.01 Essex Club (.7) (Item title, significance level)
 52 Park Place (Location)
 NRHP (Explanatory notes)

Item number
 Item type
 Pattern number

Using the appropriate item symbol in its designated pattern color and tonal intensity (significance), each item is then entered onto its pattern diagram in the appropriate location. The eight subsidiary patterns are principally data grids; they are not intended to have the pictographic value, relative to targeting problems and solutions, that the three composite patterns will have. In fact, the sub-pattern maps should include, either directly or on overlays, item code numbers identifying each feature. In this way the sub-patterns serve as keying diagrams for the catalog. Feature symbols and pattern tones may be produced by various computer graphic programs, by way of screened graphic film or custom-produced rub-offs. They can also be replicated cost-effectively using a good set of colored pencils.

Here is an outline describing the basic patterns, sub-patterns, particle types, and how they are evaluated. Again, the three central patterns are social, sensory, and transport. The social pattern, which appears in red, depicts the variety and degree of visible, public activity by individuals and groups, and charts principal paths of pedestrian movement. Sensory pattern, in green, concerns the visual and symbolic properties projected by buildings, walls, vegetation, and other physical effects. The transport pattern, in blue, reflects the presence and availability of transit networks, vehicular access and volume, and provision and preferences for parking.

Social Pattern

Two data streams or sub-patterns constitute the Social Pattern: Activity venues and Pedestrian track. Venues, or locations, for repeated and occasional behavior establish a pattern of varying levels of intensity, or frequency of occurrence, across the campus and the surrounding district. Behavior itself is gauged on a spectrum of intensity, from active (athletics, exercise) to fully passive (napping, sunbathing). The pedestrian track chiefly concerns paths and volume of pedestrian movement irrespective of building interiors, street cartways, and other areas undesignated for pedestrians. Distribution of residences and workplaces (including classrooms) also contributes to the pattern by portraying the track as an origin-destination network.

Sub-pattern 1: Activity Venues

Behavior settings Behavior settings are specific, usually public, locations that support standing patterns of repeated activity.

Active public behavior Defined locations supporting physical activity characterized by movement such as running, jumping, or throwing.

Semi-active behavior Visible and largely audible public activity of a non-physical, stationary nature (standing or sitting) distinguished by conversation, eating or drinking, or other socializing in pairs or ingroups.

Semi-passive behavior Largely solitary behavior marked by the absence of physical activity or sound.

Passive behavior Inactive behavior characterized by repose and marked by an individual or group lying at rest.

Behavioral traces Instances or locations of physical evidence either contributing to or the result of behavior settings or occasional behavior.

Gathering places Sites of periodic or occasional activity in semi-public, usually interior spaces that involve persons with shared interests.

Civic and occasional space Locations of festivals, parades, demonstrations, and other large-scale public gatherings which are either of an impromptu or spontaneous nature, or based on tradition.

Sub-pattern 2: Pedestrian Track

Pedestrian track The relative strength of residences, shops, offices, transit stops, and other origins to generate foot traffic is portrayed as a network of movement lines. It translates the spatial arrangement of high-access public claim into a pattern representing actual movement.

Off-network paths Mid-block passageways, park walks, and other paths which occur outside the central network of pedestrian flow.

Residence-workspace distribution Chiefly student residences and the distribution of students, faculty, and staff by building, as an origin-destination network, account for much of the pedestrian path-track system.

Sensory Pattern

Four streams of information make up the sensory pattern: Architectural elements, Natural features, Cultural factors, and Associative effects. Architectural elements chiefly concern the visual impact of built form; that is, the nature and relative significance of individual buildings and building groups. Natural features considers the site from an environmental perspective — the geological, topographic, vegetational, and atmospheric components and how they bear on the site's visual and functional richness. Cultural factors view the site as a venue for cultural activity and artistic expression. Associative effects responds to the site's symbolic dimension — the capacity of site details and ensembles to project and register meaning.

Sub-pattern 3: Architectural elements

Buildings Significant structures of an architectural, engineering, landscape architectural, or planning nature which exhibit current or historic distinction by virtue of design or construction.

Fragments Chiefly architectural ruins, remnants or segments having significance as designs or as historical or archeological sites.

Accessories Landscape architectural elements which by virtue of design, location, age, or use are in some way unusual. Includes fountains, pools, walks, walls, etc.

Paving Paving materials and methods on cartways, walks, plazas, and other components of the pedestrian-open space system are noteworthy to the extent they divert from current or prevailing construction practice.

Vistas Visual tableaux beyond the middle-range of observation, representing long strands or broad expanses of urban fabric which promote orientation, sense of place, socialization, or sensory appeal.

Viewscapes The full complement of architectural and landscape effects making up the close- to middle-range perspective of the pedestrian moving along a street or other space affording customary public access. Viewscapes have two fundamental parts: an enclosing component making up the perspective cavity; and an ambient component constituting the walk or path.

Enclosing component Building facades, walls, terraces, trees, and other chiefly vertical elements that frame the perspective.

Enclosing component with improvement potential Vacant, abandoned, or derelict structures in poor repair which have reasonable potential for substantial refurbishment or renovation.

Ambient component Sidewalks, paths, street cartways, street furniture and accessories, and landscaped areas making up the floor surface of the perspective.

Plan characteristics Aspects of the geometry of streets and open space in which the campus is located that are significantly representative of overall city layout as a plan.

Sub-pattern 4: Natural Features

Vegetation Plant materials cultivated in manmade arrangements or in a natural state on public, semi-public or private grounds and tracts.

Trees Significance indicated by maturity, canopy size, and relative condition and contribution to the immediate environment or viewcape.

Ground cover; hedges and shrubs Garden plots, planting beds and other horticultural layouts maintained on a permanent basis.

Public open space Principally green space accessible to the public without constraint. Includes parks, playgrounds, plazas, squares, garden terraces, etc.

Semi-public open space Ornamental or natural space affording only visual access by the public. Includes private gardens, semi-public lawns and grounds, cemeteries, etc.

Physiographic features Exceptional geographic or vegetational elements irrespective of other open or green space. Includes rock outcrops, steep slopes, ravines, canyons, etc.

Ambient effects Locations where light or air, together with immediate environmental elements or forms, create noteworthy atmospheric effects such as warmth, cold, brightness, obscurity, etc.

Sub-pattern 5: Cultural Factors

Arts and cultural landmarks Buildings or other structures exclusively or strongly associated with literature and the arts.

Public art Includes statues, sculptures, murals, etc., in public access settings, in addition to significant artworks occurring in interior or semi-public spaces suitable for limited public exposure.

Memorials Monuments, markers, signs, plaques, or other physical evidence which designates the site of historic events, observed traditions, or the work of notable persons.

Place identifiers Landmarks and other physical elements not claimed by the above categories, which reflect the character and substance of campus life or the social history of the area.

Sub-pattern 6: Associative effects

Signs and symbols Permanent or semi-permanent message devices which name or advertise the campus, other services, products, manufacturers, public functions, districts, open space, etc.

Spatial framework The capacity of the campus to symbolize a structure with entrances, exits, rooms, corridors, and other spatial features.

Haptic and other sensory cues Locations from which chiefly sounds and smells or other non-visual phenomena contribute either to an essential quality or characterization of the campus and vicinity.

Typological congruence Natural or manmade structures and elements which by component or ensemble reflect a consistent, pervasive or otherwise identifiable pattern, motif, etc.

Resonance Environmental resonance is the capacity of certain objects or spaces to "re-sound" with special significance. They claim attention by virtue of rare historic value, formal complexity or compelling resemblance to other settings. The association itself, in which attributes of one scene operate in singular relation to another, particularizes the setting and gives voice to the response. The built environment exhibits several categories of resonance, including these three:

Typological deviation and displacement Buildings or structural ensembles suggesting typologies or generic landscapes outside the region;

Public recollection Locations of buildings or other elements demolished or destroyed but which are recollectable in active public memory;

Historical compression Locations which accommodate long-term standing patterns of behavior, or which serve as the sites of public calamity, acts of God, or exceptionally historic events.

Transport Pattern

Two data streams make up the transport pattern: Transit and vehicular access and Parking. Access to the campus and district concerns the means by which students, faculty, and staff convey themselves from within and outside the area. Pattern intensity is indicated for streets, routes, stops, and stations according to the relative intensity of the various travel modes, based on volume per mile, comfort and convenience, schedule reliability, and on-site land consumption. As for parking, its distribution and relation to the street network from a campus perspective is chiefly a function of preferences and availability for students. Parking is integral to the vehicular system; however, it receives lower overall modal pattern intensity primarily as a result of very high land consumption.

Sub-pattern 7: Transit and vehicular access

Commuter rail and subway lines (if any)

Bus-shuttle transit Includes only those routes with designated stops from which students, faculty, and staff have reasonable access to an edge of the campus (less than 5-minute walk).

Vehicular routes Local streets and roads carry varying traffic volumes, depending on roadway classification, parking, seasonal factors, etc. Pattern intensity can reflect AWDT (average week-day traffic) volumes or on-site counts.

Service-emergency access Certain service and other vehicles create negligible volume but a significant auxiliary pattern within the dominant network. Indicates movement by maintenance vehicles, delivery and other service trucks, motorcycles, and campus police.

Sub-pattern 8: Parking

Off-street parking Off-street facilities register significance based on land-use efficiency. For example, below-grade and mixed-use garages receive higher pattern intensity by relative variability: they allow for other uses on the same property. Surface lots, which exhibit high land consumption and low unit/area ratios, receive low pattern intensity.

On-street parking The usual varied and complicated menu of options and restrictions, indicated by block and side of street.

Student parking preference Off- and on-street alternatives always present an "option maze" for student commuters. The daily search for the least-restricted space constrains legitimate use of permit parking and contributes to other violations. Nevertheless, the option network yields a fundamental preference pattern of varying desired spaces.

Data from the eight subsidiary patterns are merged to form composite diagrams representing the basic patterns. It is these three images with which the method substantiates its capacity to portray a site both in detail and fluctuations of significance. With few exceptions, all features from the sub-patterns are duplicated on the composites. Behavior settings, for example, are distilled into "activity gradients" to better indicate variations in use intensity overall.

The centerpiece is the sensory composite, perhaps because it relates most directly how the environment looks and feels. In the absence of computer graphic capabilities, it can be rendered on opaque paper, with the other two patterns, social and transport, serving as overlays (on acetate). Or the three can be prepared separately, then combined photographically as necessary. As noted earlier, composite pairings also convey useful information by themselves.

Combining all three, of course, yields the full composite inventory, which provides the most comprehensive site image from simultaneous standpoints — detail and pattern sweep. This diagram becomes the core document of the process, which establishes directions for all subsequent work as to problems, areas for further study, design assessment, and so on.

On campuses with widely apparent evidence of visual and functional breakdowns requiring new master plans or plan updates, the composite can be used to recast the inventory at a wider angle, in which features of lower-range significance are jettisoned to yield diagrams with only the most relevant components of a visual-functional structure, or "composite framework" (see "Case Study: The Method at Rutgers").

The framework is a useful bridge between analysis and design because it provides the means of testing broad design concepts without an overabundance of detail. Once the range of concepts has been narrowed to, say, a couple alternatives, they should then be tested on the composite itself, under the "implanting" procedure referred to earlier, in which design schemes rendered in the language are inserted into the composite, with all their impacts, good and otherwise, indicated. For design ideas large and small, the composite becomes the central evaluative tool.

From another perspective, it can also serve as the basis for assessments by spatial unit. Composite segments — blocks, building groups — depicted as units, can be incorporated into the inventory catalog for the dual purpose of evaluation and design by the unit, as well as to assemble a campus spatial typology. The usefulness of this approach stems from the frequent requirement to narrow the scope of review to a manageable scale. A typology is created by assessing each unit on its overall strength among the three patterns, then determining the number of variety of spatial types.

Close scrutiny of each unit, by type, will reveal subtle variations and distinctions among units making up a sequence. Design, in those terms, can be seen as the mediation of differences that may appear jarring or confusing, and which may be found to undercut the campus's visual coherence. Clarifying and reconciling spatial types is perhaps the most useful and cost-effective approach to design that the method makes possible.

Case Study: The Method At Rutgers

The Newark Campus of Rutgers University in Newark, New Jersey is the second largest of a three-unit, state university system that includes Camden and New Brunswick — its central, namesake campus, which began operation in 1766. Before 1946, Rutgers-Newark was the University of Newark, itself a consolidation of several local professional colleges dating from the 19th Century.

The campus at its present location, just blocks from the commercial heart of downtown Newark, began as a major urban renewal project, first funded in 1959. This set off a wave of construction in the Sixties, from which five buildings making up the central campus plaza were opened by 1965. Five years later there were 13 buildings comprising just under 600,000 gross square feet of space. Today that figure is 1,900,000 square feet, across some 31 buildings. With just under 10,000 students, the school is one of four institutions of higher learning within a 1000-acre planning district known as University Heights. Together the four schools enroll more than 45,000 students.

Newark continues to struggle against the negative image forged in 1967 by riots in the black community. The city is a veritable museum of public housing, with what appears to be every planning and architectural theory related to housing in the last half-century represented in grim, colorless projects arrayed along the bluffs above the Passaic River. But in recent years an inspired homebuilder spearheaded construction of over 1100 townhouse condominiums on the site where the riots began. The new units are designed to lure back to the city professionals and white-collar workers who now fill the downtown's new office space, over 5 million square feet of which has been constructed since the 1980's. The entire northern tier of central Newark, which includes the Rutgers campus, is now the focus of redevelopment efforts on several tracks, including a \$250 million entrepreneurial-research complex called "Science Park," and a multi-

use "Cultural District" along the banks of the Passaic. Its centerpiece will be the new State Center for the Performing Arts, scheduled to open to theatre patrons next year.

Remarkably, these and other major elements of this broad segment of downtown are positioned in some kind of alignment to an unassuming side street known as New Street. At least conceptually, New Street is the axis that knits the entire district together (Fig. 1). In all likelihood it was this "corridor," which follows the centerline through the campus's original, Sixties-era plan, that germinated the initiative to launch a comprehensive, environmental design study of the campus.

The study's planning process, begun two years ago, adopted the Particle Method throughout. Techniques used in site research replicate their description in the previous section, "Procedures for Campuses."

Site inventory revealed the Rutgers campus to be an imageable component of a large and variable urban district in search of a new identity. Company closings, layoffs, and building demolitions are offset by major rehabilitation efforts, such as at nearby Newark Museum and the conversion of a former department store to shops and offices. An incipient student residential housing enclave co-exists with crime and homelessness.

Socially, the campus is the focal point of the district. Its activity venues, somewhat unfortunately, are characterized by the school's cafeteria/fast food outlets. Like most campuses, Rutgers is populated by students who are very practiced in the suburban rhythms of fast food and the atmosphere of a shopping mall. The campus also generates most of the district's foot traffic, among classrooms, residences, parking, and transit stops (Fig. 2). Small pockets of retail use are effective catalysts of movement as well.

From a sensory standpoint, the school's physical presence falters somewhat next to the more imageable stretches of nearby Washington Street, highlighted by the estimable Newark Museum, the city's uncontested jewel (Fig. 3). The district's natural features reveal the strength of the visual frame it makes along its east side, with two handsome, triangular parks (Fig. 4). While the parks and museum display most of the site's cultural effects (Fig. 5), the campus itself, from the perspective of the school, shows a serviceable pattern of symbolic and indigenous features (Fig. 6).

The district's transportation network is perhaps the school's major strength (Fig. 7). A clear hierarchy of streets, along with abundant transit options represented by convenient access to buses, subway, and commuter rail constitute a healthy functional structure. Parking, from the standpoint of student use, is a crazy quilt of competing preferences, which generates unnecessary "search volume" on a daily basis (Fig. 8).

The Composite Framework (Fig. 9) portrays the district as having potentially strong axial linkages between the campus and certain peripheral elements. This is consistent with the school's positive stance toward integrating its presence into the larger community. Implied connections among the campus green of the New Jersey Institute of Technology (NJIT), the Rutgers central campus plaza, and Military Park — all on the centerline of New Street — establish new directions for the campus as a maturing visual-functional setting.

Constituent Design Framework plans (Figs. 10-12) were developed along the three pattern parameters. They enabled the overall plan to emerge as an assemblage of parts that, in most cases, are multi-dimensional; that is, they operate along more than one pattern simultaneously. The social framework, for example, is a new grid of mid-block pedestrian linkages that visually extend the dimensions of the campus without the requirement of major land purchases estab-

lishing new campus edges. The sensory framework follows suit, with frequent visual "events" — a landmark, cafe terrace — accenting the path system's enhanced social status. The transport framework attempts to tug the area's transit system toward locations closer to campus edges.

The Composite Concept Plan (Fig. 13) moves the process to the start point of component plans and designs — the project's second phase in which work is proceeding currently. Under preparation now are schematic designs for a revamped central campus plaza (Robeson Plaza) and for elements along the New Street corridor linking the plaza with Military Park.

Future Applications

As a set of procedures that go the heart of the land analysis process, the method has manifold potential to redirect the aims of site research along new channels. Its applications in computers, for example, are obvious. The personal computer's well-developed graphic capacity to move up and down in scale, to organize information in layers and sets, and to render in color make it the medium of choice. Moreover, computer-generated images that represent simultaneous considerations of detail and broad impression can only amplify the benefits of a method whose purpose is to portray shared responses to the environment.

But whether future programming applications adopt AutoCAD, GIS or other graphic formats, their effectiveness remains to be seen. (Development of a software package, however, is currently being explored by the author.) A method program, under whatever format, will only be as useful as its technical capabilities to organize site information.

The key is a graphic language that gives "voice" to the environment. But that language can take several forms, expanding to encompass data on many levels. So long as location is the fundamental variable after which everything else follows, site diagrams can "layer over" ancillary systems data as required. Residential information, for example — Census tract data and the like — usually organized in tabular form, or worse, in graphs and pie charts, could be exceptionally useful in instances where site planning edges into social policy. As it concerns college campuses, relevant information about curricula, times and locations of extracurricular activities — even scenarios for future construction — could be advantageous when applied to advancing the campus's visual and social patterns.

The method can only augment its utility in terms of recording changes over time. Quality and typological assessments, seen from the perspective of years, will give the process a dimension it arguably has never had, because the built environment has rarely been convincingly portrayed as a measurable base of information. Changes, their benefits and repercussions, when viewed through the filter of time, demonstrate how the environment transforms itself incrementally — not by the instant gratification implied by lavishly rendered plans and models. Time is also potentially expressed by recorded changes by time of day and year. Much useful information can come out of research into the typological mutations a campus undergoes, depending on the season.

Finally, there is the spatial dimension, applied by comparisons that can be made among campuses and campus communities. The method might well become a cost-effective substitution for tours and visits of other campuses by a school's planners, physical plant administrators, and other officials seeking to learn the secrets of how other institutions manage a lively social setting, a certain physical presence or "look," or an exceptionally efficient parking system. Under

the method's graphic capacity for portrayal, those secrets will not be quite so difficult to divine. There will be a language with which nearly everyone is familiar.

Footnotes

1. Kevin Lynch, *Good City Form*. The MIT Press, Cambridge, Mass., 1981, p.357.
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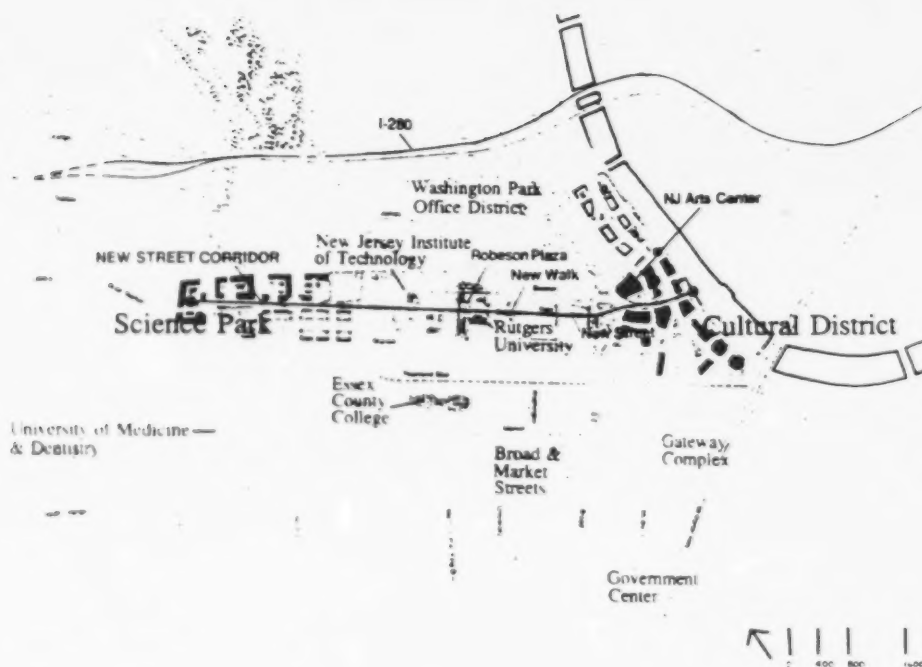


Figure 1. The norther tier of central Newark, oriented to the "New Street Corridor," with the proposed "Science Park" and "Cultural District" at either end.

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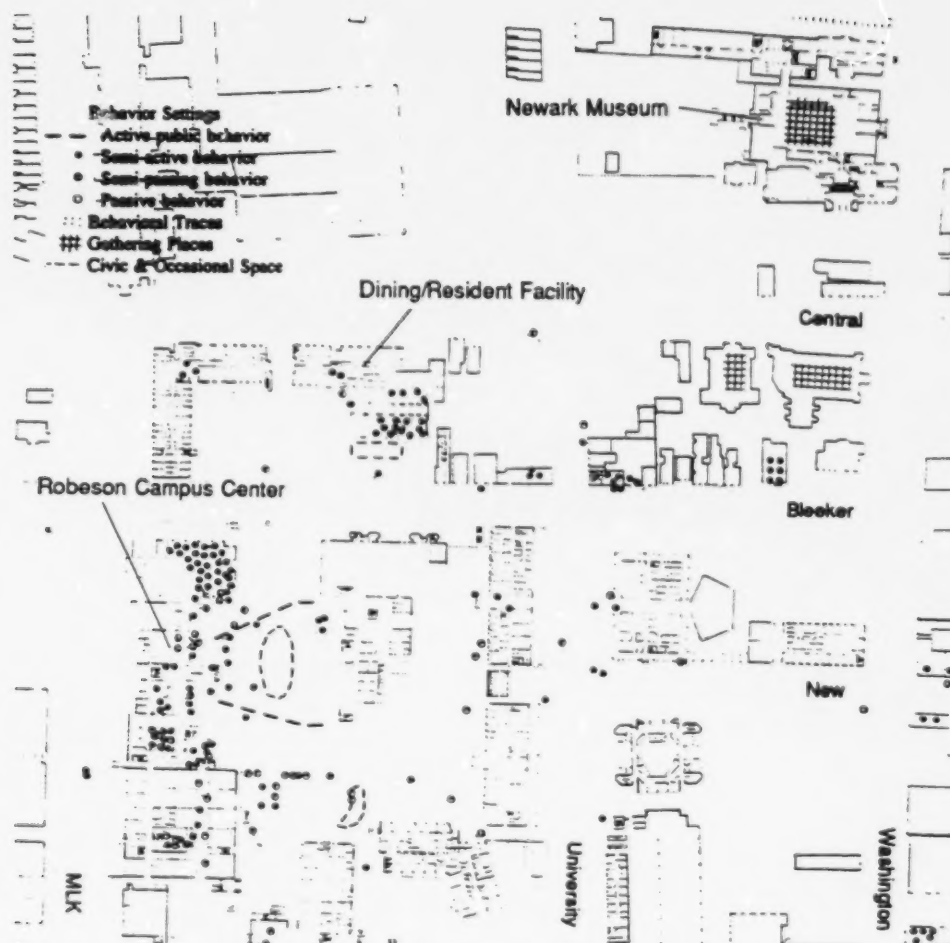


Figure 2. Sub-pattern 1 / "Activity Venues" (Detail).
The main peak-hour social spaces concentrate at the campus's student center, with limited distribution across the central campus plaza.

Author's note: Readers should be aware that the rendering of this and other four-color diagrams here in the black-and-white format of this document critically undercuts their visual clarity and impact.

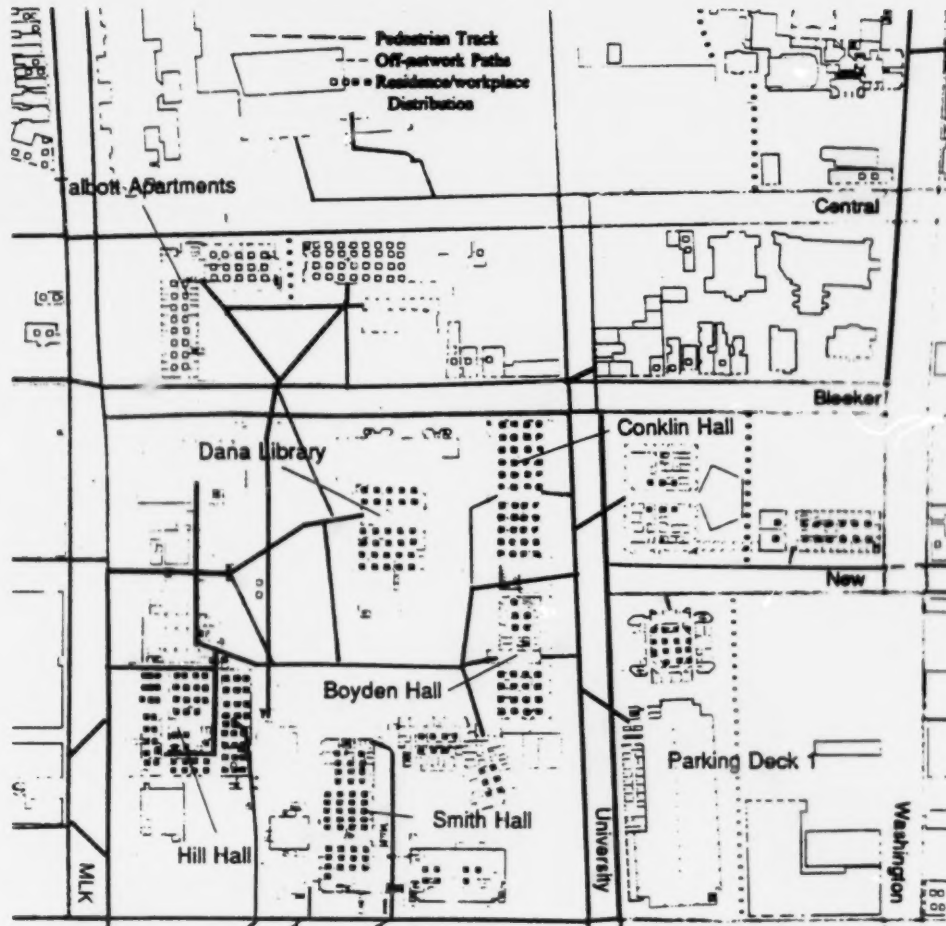


Figure 3. Sub-pattern 2 / "Pedestrian Track" (Detail). The campus community principally as a pedestrian origin-destination network linking residences and parking with classrooms and other school activities.

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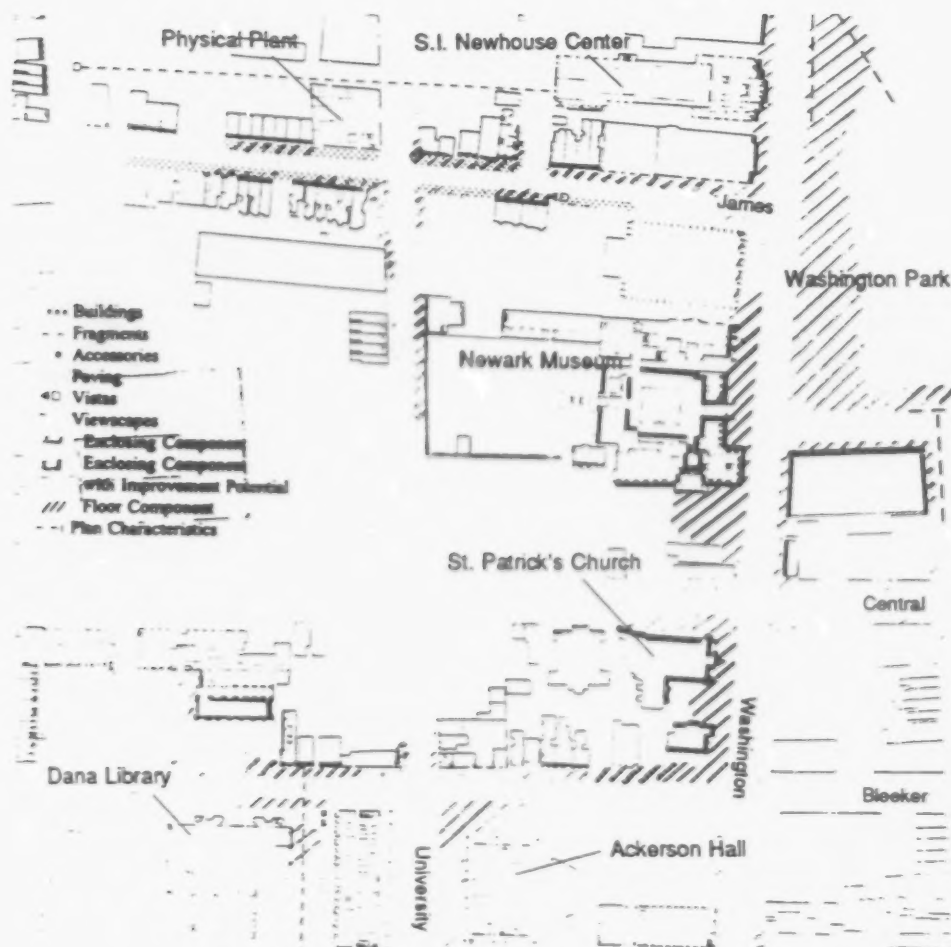


Figure 4. Sub-pattern 3 / "Architectural Elements" (Detail). The physical presence of the campus is eclipsed by stretches of Washington Street that includes the Newark Museum.

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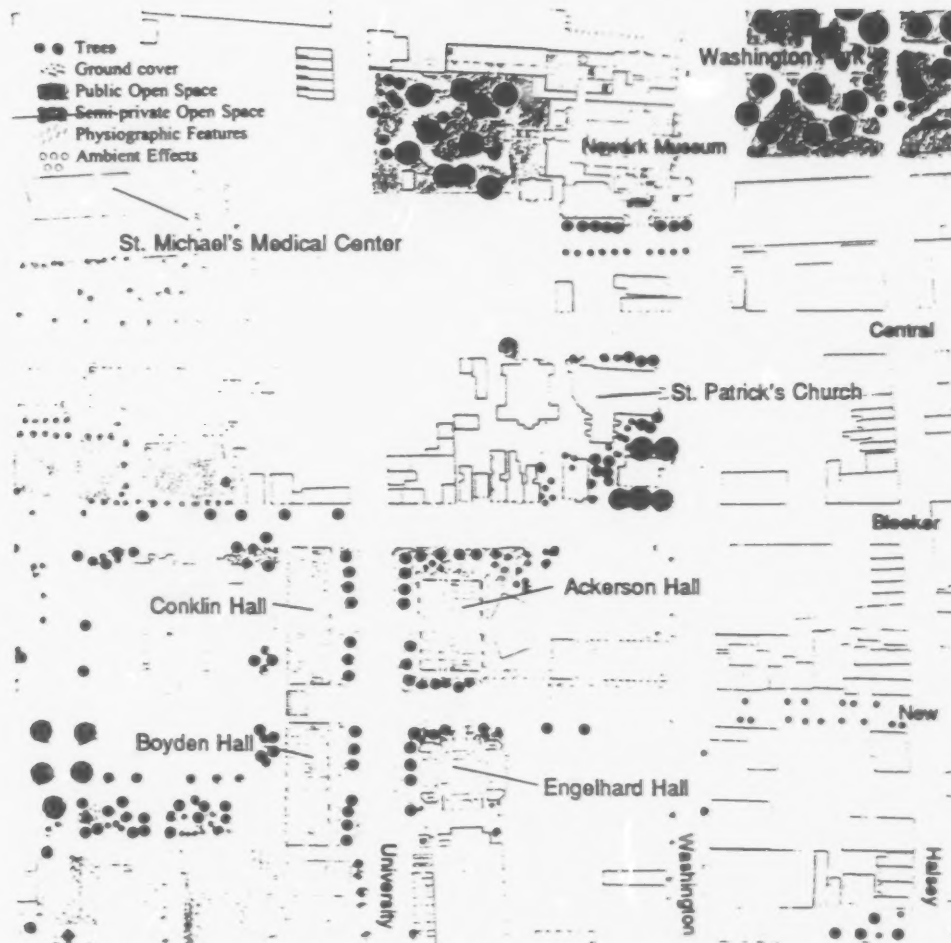


Figure 5. Sub-pattern 4 / "Natural Features" (Detail). The school's most imageable street segment is the central portion of University Avenue, although there is only tenuous linkage to other locations, such as the rear courtyard of the Newark Museum.

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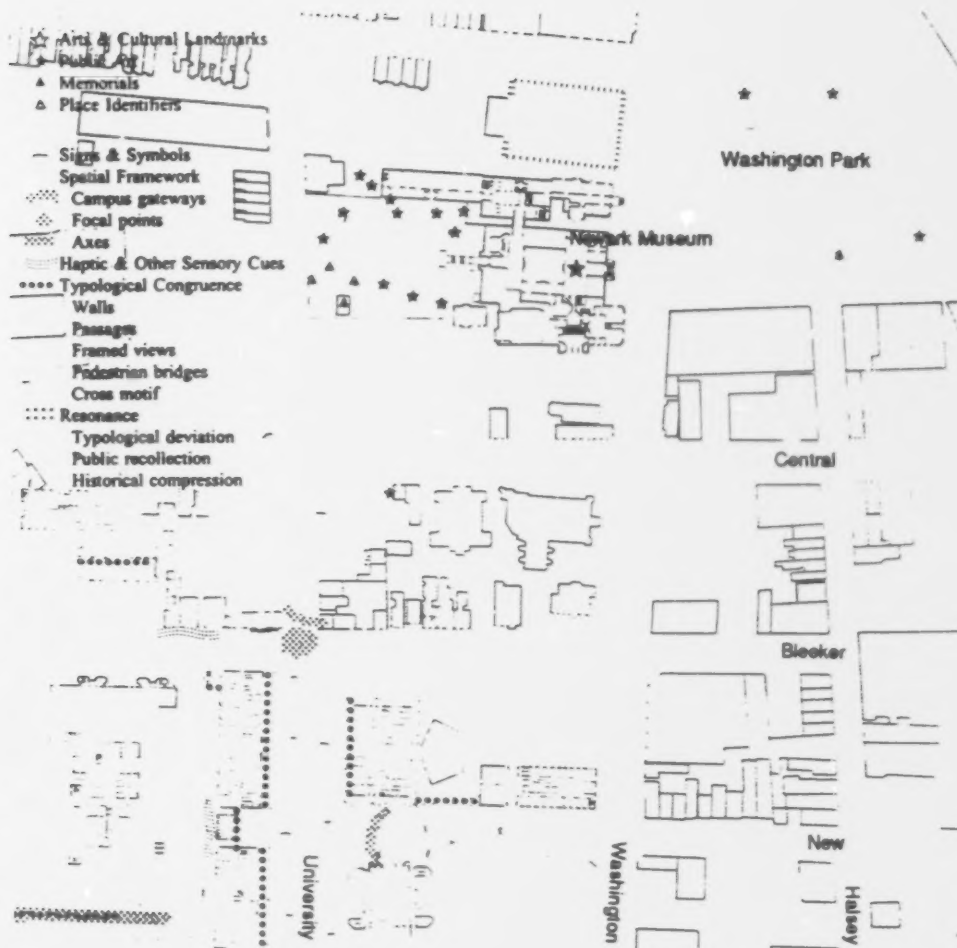


Figure 6. Sub-patterns 5 & 6 / "Cultural Factors and Associative Effects" (Detail). While artworks and memorials help define Washington Park, the campus displays a wide vocabulary of signs and symbols that promote its legibility.

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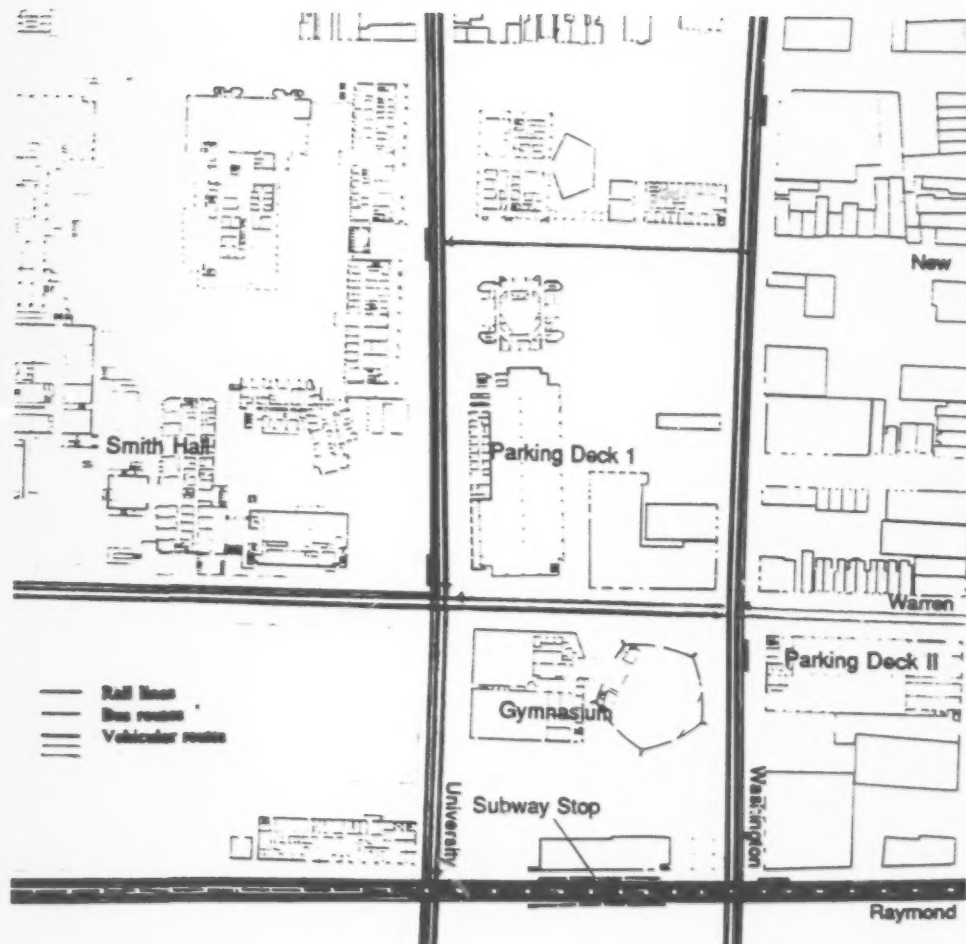


Figure 7. Sub-pattern 7 / "Transit & Vehicular Routes" (Detail). The campus is adequately served by a strong street hierarchy, as well as by long established bus and rail systems.

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Figure 8. Sub-pattern 8 / "Parking" (Detail). The school's parking decks do not eliminate the daily odyssey by commuting students in search of favorable parking locations.

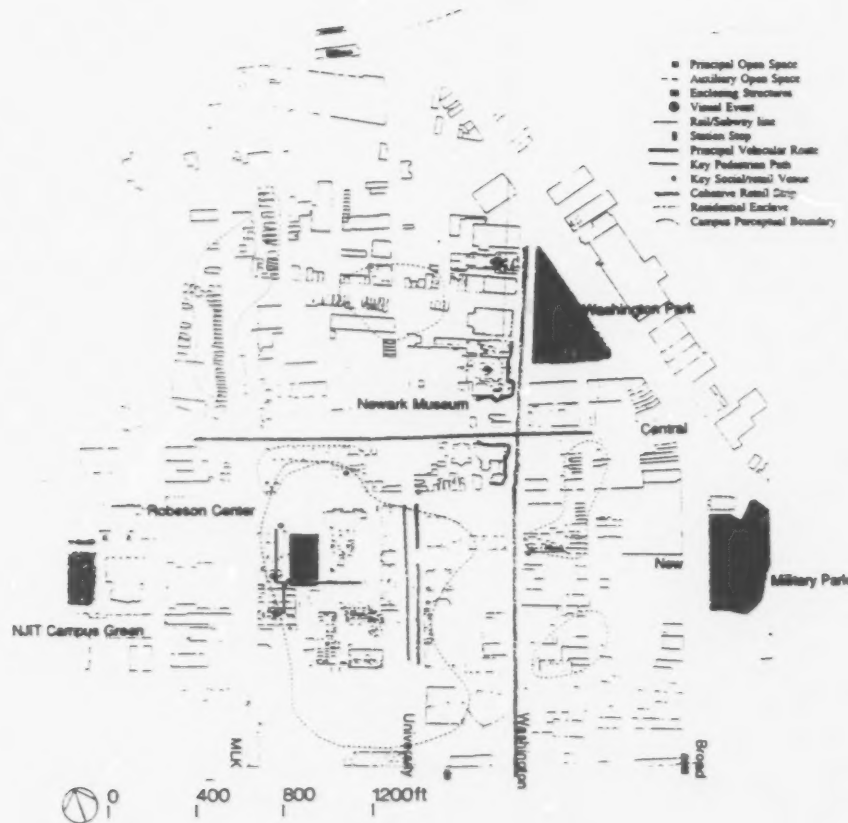


Figure 9. "Composite Framework." The district exhibits the outlines of a structure that offers potential for linkages among key open spaces and a more developed social activity network.

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Figure 10. "Design Framework / Social Pattern." The district's social objectives will be furthered by a mid-block system of walkways and development of new social venues along New Street.

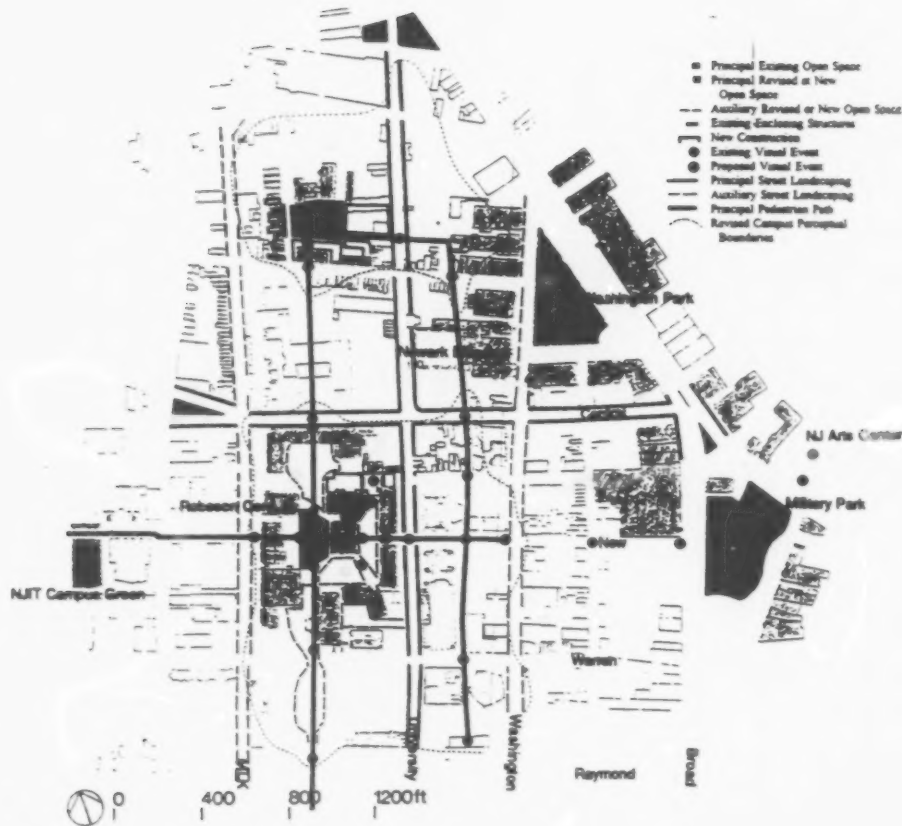


Figure 11. "Design Framework / Sensory Pattern." The campus and surrounding vicinity are recast as a multi-layered system of streets arranging the district into quadrants interlaced with a new pedestrian grid.

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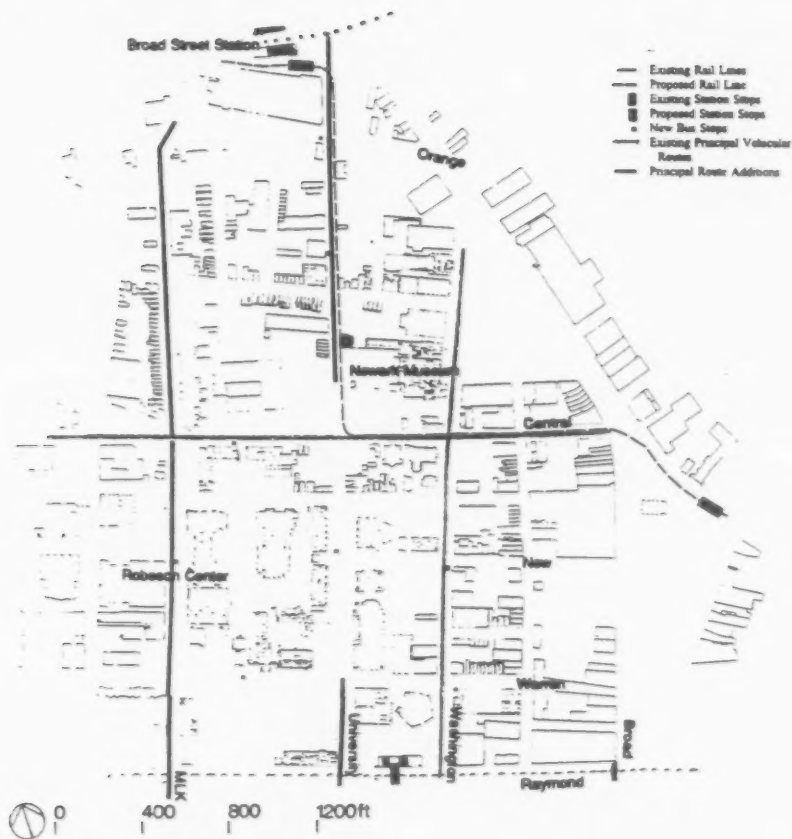


Figure 12. "Design Framework / Transport Pattern." Drawing a proposed streetcar rail system closer to campus edges and directing more traffic onto key streets will result in a more efficient circulation system.

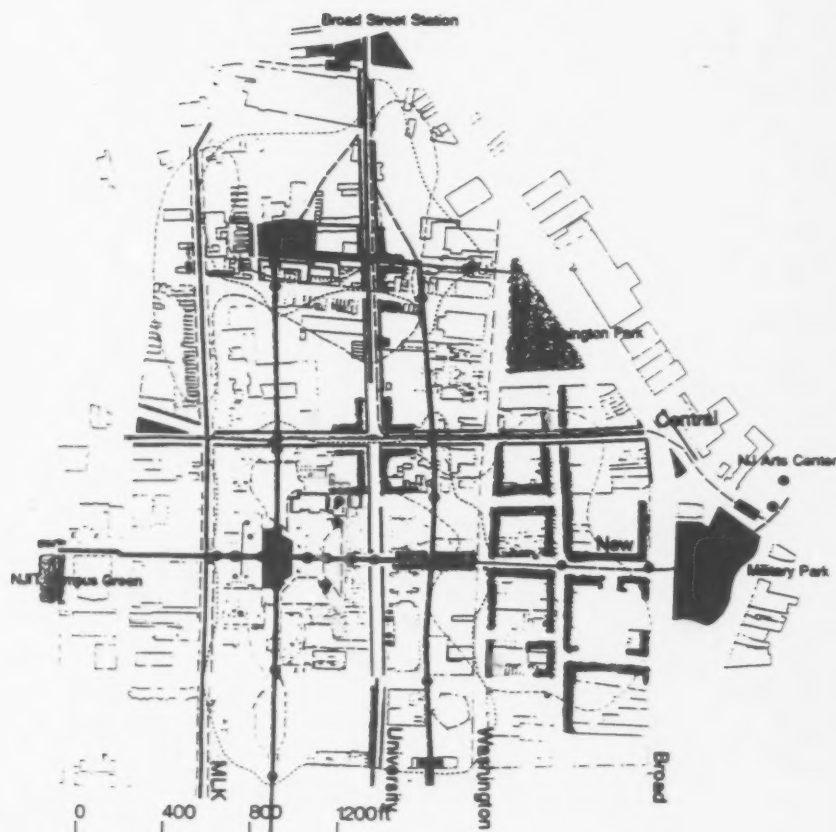


Figure 13. "Composite Concept Plan." The plan overall proposes a more vivid, legible, and interrelated apparatus for accessing and experiencing the campus district.

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“Right-sizing” in the 1990s - Shaping the Future with Master Planning

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Introduction

The late eighties through the first half of the nineties has been a remarkable period of organizational change for many of America's institutions and corporations. Corporations such as IBM, long regarded as synonymous with permanence and stability, are rocked by upstart competition. In the public sector politicians are actually advocating the radical reduction of government with growing support in the Republican-dominated Congress for reforming or eliminating fundamental services, while Vice President Gore's reinventing government has focused on restructuring delivery of traditional services. Despite the collapse of President Clinton's ambitious healthcare reform the healthcare industry is undergoing unprecedented reforms driven by broad market and economic forces resulting in fundamental changes in the structure of the healthcare industry.

Will higher education be next? In this decade the public and private institutions of higher education in this country have experienced unfamiliar market and economic pressures. Today, colleges and universities have had to rise to meet multiple internal and external challenges. Some have struggled to stay alive. All have had to make changes to respond to the changing environment. Many are having to redefine themselves to sustain viability.

Some of the external challenges are:

- The market of college-age students has dropped dramatically from the go-go years of the baby boom generation;
- The labor needs of the society as a whole have changed; there is a growing need for “life-long” learning;
- There have been major changes in the traditional professions;
- The cost of higher education has risen at a much higher rate than the cost of living;
- The public sources of revenue — federal research grants, direct state subsidies (for public institutions), tuition loan program — are shrinking
- There is greater competition for the private philanthropic dollar

- The competition changes as it responds to the same environmental conditions
- The technological revolution: the role of computers and telecommunication in education.

Colleges and universities that want to survive (let alone thrive) have been reexamining their role, mission and strategic goals. Through such efforts institutions are restructuring and focusing resources; and as a result, existing facilities have become increasingly out of alignment with the evolving purposes of the institution. For example, a college that has relied heavily on large lecture-size teaching sections has decided to reorient to a smaller seminar-size teaching model, resulting in too many large lecture halls and too few seminar rooms.

Even without market and economic pressures the incremental natural evolution of academic programs and the gradual introduction of new programs and needs within an institution will develop a significant misalignment between goals and the facilities available to meet those goals. For example, a college that has been traditionally a commuter campus has determined that to stay competitive it needs to develop a residential campus community.

The term "right-sizing" is a recent coinage from the world of business consulting. It is a variant of "down-sizing", which emerged in the eighties to describe the refreshing and dramatic reduction of staff that took place in many large corporations in the last decade. In a discussion of the whole organization, "right-sizing" can refer to all the inter-related aspects of the organization's response to change which include markets, programs, organizational configuration, staff size, financial budgeting, to name a few. In this discussion we will focus our concerns. For our purposes, right-sizing refers to the process of putting into alignment the facility assets with the institution's goals.

The position of this author is that the most effective process for responding to the facility component of "right-sizing" facilities is through a comprehensive facility master planning. In this presentation we will give you the why, what, when and how of master planning as a proactive response to the future and a rational approach to "right-sizing".

The Role Of Master Planning In "Right-sizing"

Master planning is an intellectual discipline for determining coordinated actions to accomplish desired goals. A master planning process is the rational process for right-sizing

Master Planning is an analytical and creative activity that results in a coordinated set of decisions (the plan) about activities to be taken to accomplish stated goals.

One of Steven Covey's principles for effectiveness is to begin with the end in mind. To get somewhere you need to know where you are going. In planning the future of an institution the critical starting point is a vision for the institution's future. And building on that, a specific set of strategic objectives.

The process leading to master planning considers three broad categories of information: strategic, functional and physical. First, the planning team gathers data about the market, competition, enrollment, academic programs and financial context. (much of this may already be available as a result of standard and on-going planning activities). Second, a thorough understanding is developed concerning all the functional and operational aspects of the institution: academics, research, administrative, support services, community, and student life. Future space needs and operational models are projected on the basis of the strategic and academic planning decisions. Thirdly, the physical aspects of the buildings and real estate are analyzed with respect to capaci-

ties, condition and potential. The multiple physical characteristics such as traffic flows, accessibility issues and aesthetic characteristics are described.

The most creative part of the planning process is the options development phase. The most important asset for arriving at good facility solutions is to have plenty of options from which to choose. Options are postulated to "solve" the facility requirements (derived from the strategic direction) of the program. The range of options should test the limits so sacred cows need not apply.

Since there are no perfect solutions the planning team must make carefully considered judgments regarding the tradeoffs intrinsic to each option. Through review and debate among the planning team a preferred option will emerge which serves as the basis for the recommended master plan. Additional detail establishes the plan's implementation feasibility. The final plan must define the specific projects for implementation, determining costs and the sequencing logic.

Strategic Direction

A facility master plan must begin with good definition of the strategic direction of the institution. To paraphrase what the Cheshire Cat said to Alice in Wonderland, "If you don't know where you're going any road will get you there." For colleges and universities this question can be answered through a process called strategic planning.

The essence of strategic planning is to make decisions about the fundamental direction of the institution on the basis of a thorough review of the internal and external conditions employing a participatory process. There are four major components of a strategic planning process:

- Define an institution-wide process and form a strategic planning committee.
- Conduct an internal and external assessment to determine the strengths, weaknesses, aspirations and opportunities, and challenges for the future.
- Revise the institution's missions, goals and objectives statement to reflect the new understandings. Identify measurable goals.
- Establish an on-going procedure including responsibility assignments and schedule for monitoring and measuring progress toward the selected goals.

Sufficient time should be allowed so the participants develop a thorough understanding of the issues. The process should be expertly facilitated. And, since there will be many differing opinions, time to discuss and arrive at consensus is critical to the credibility of the process.. Groups of participants should be formed to analyze relevant factors such as internal and external factors. For example, a task force of planning committee participant plus some additional members could be charged with examining external issues such as fiscal/political, social/demographic, economic/technical environment, and the institutional/competitive environment.

The strategic planning process is as much a vehicle for leadership as it is for changing direction. Three critical characteristics contribute:

- A shared understanding of the situation evolves through the discussion of the internal and external assessments;
- A strong sense of shared authorship is fostered through the participatory process
- The process is a forum for communicating the president's vision for the institution.

Needs Assessment/programming

"Right-sizing" is the process through which we make facilities appropriate in size (and spatial characteristics) for the program use. When we "right-size" we are realigning the facility assets with the actual or projected facility needs. Clearly a critical step is understanding the needs. What are the sources for information? How do we go about establishing the need? How do we know what is fair and balanced?

One way to determine what space a department needs is to ask the users. Although the users should know what they need both for current operations and for a projection of future operations (derive from the strategic directives), users are likely to exaggerate or underestimate their needs. User input is an obvious and important source of information, but by itself, it is not sufficient.

Identifying credible objective standards for space allocation decisions is critical to the planning process. Institutional standards can be established to set the basis for office size and will help preserve equity between departments. Industry design standards are useful for establishing the space needs for classrooms, labs and other teaching spaces usually expressed in square feet per student. Normative standards serve to compare the needs of any department with the other institutions grouped by selective categories. For example, if you were analyzing the space or adequacy of the library you could look at the number of volumes, or look at volumes per student, in the library of your peer (or competing) institutions. There are also recommended book lists (titles) for each academic discipline. Librarians compare the lists to the titles on hand and report it as a percentage which provides a basis for comparison with other institutions. Institutional comparisons are often based on peer institutions but it can also be meaningful to draw comparisons with "aspirant" institutions which indicate where you would like to be.

This part of the process is iterative. The consultant's objective criteria serve as a benchmark. The variants between the actual or requested spaces size and the standards should be highlighted and department chairs are asked to explain and/or justify if variations from the standards are sought. Not that the standards should be adhered to slavishly. Unique aspects of a particular department may be ample reason to explain greater space allocation. For example an emphasis on lab/research in an undergraduate science program which distinguishes the program from the competition may justify the higher than normal allocation of space to that program. The planners identify and analyze anomalies and the analysis becomes the framework for projecting future space requirements.

Building Analysis

Another part of the equation is the existing facilities. In the physical analysis portion of the master planning process planners examine these assets in depth to establish the appropriateness of the functional assignment, the adequacy of space size and space characteristics, the location on campus with respect to other functions, compatibility with use zoning, flexibility and growth capacity. The analysis generally includes investigation of the building condition: deferred maintenance, life expectancy of major systems.

In many cases functions require very particular spatial characteristics. Theater and dance programs require spaces with special characteristics: certain dimensions, ceiling height, acoustical properties etc. Often a particular arrangement of functions is critical: performing spaces,

practice rooms, dressing areas for example. Clearly, science labs and dance studios are not interchangeable if the program emphasis changes.

Through the building analysis the basic building condition will be determined. It isn't uncommon for a campus to have sustained poor buildings too long. A "right-sizing" process provides that opportunity to take some buildings "off-line". This affords the possibility of improving the overall energy and operational performance of the campus. There is often reluctance to take down obsolete facilities and on many campus there are still many "temporary" buildings built during the Second World War which are hard to get approval to demolish. Often, tearing down such facilities will save valuable resources.

In some states, funding formulas for operational support of state institutions have been changed from allocations based on the gross square footage to allocations based on per capita student enrollment. Under the former there is no incentive to efficiently utilized buildings. With the change, inefficient and poor performing buildings are a distinct burden. Every square foot of building requires a constant flow of dollars for operations: heating/cooling, maintenance, house-keeping, security. This was a primary driver of the master plan at Cleveland State U., the premise of which was to tighten the utilization of space so that poor facilities could be removed! Instantly there is a paradigm shift. The new formula would pop into focus the importance of making sure those assets were well-deployed.

A thorough analysis of buildings can involve evaluating all building systems: the structure, the architectural shell, the mechanical and electrical systems, elevators. It is wise also to look at basic compliance issues such as ADA, basic life safety code issues, in some areas seismic. Energy consumption evaluation should be part of this as well. To quantify the information the life cycle cost characteristics of these building systems are developed. In this type of analysis buildings can be rated and ranked to guide decisions about which buildings to keep.

Site Analysis

For decades colleges and universities have been in the habit of acquiring properties without of its purpose and value to the strategic plan. In an environment of limited resources it may still be important to acquire properties but with a greater understanding of the value and potential role. In some colleges reduced enrollment and new strategic direction are such that significant properties could be sold — converting real estate assets into more useful (liquid) financial assets.

"Right-sizing" a campus rarely means the campus grounds should be reduced. Instead the issues generally revolve around the highest and best use of real estate. Often, even when the enrollment is not growing or is shrinking slightly there are strong reasons for making strategic property acquisitions. Programs that require a lot of site space have grown over the last few decades. For example, requirements for equality in the men's and women's athletic programs generate more need for athletic field space. Market and competition forces are driving growth of student residential options and related enhancements to student life; and parking seems to be an insatiable need.

The relationship to the surrounding neighbors and community is often referred to as the "town and gown" issue. Those that live in close proximity to the campus are always sensitive to the impact of college life and the ever-present potential for incursion of the institution into their neighborhoods. The uncertainty of the boundaries has a deteriorating impact on the physical condition of the neighborhood as investment is discouraged. One valuable result of master planning

to "right-size" the campus is a greater degree of clarity about the boundaries of the campus. Coupled with the clarity of the boundaries the institution should take a proactive approach to the healthy condition of surrounding neighborhoods by support and participation in resident and commercial neighborhood groups.

The campus leadership in the more competitive environment of today's higher education market, issues of image and aesthetics take on an increased importance. The decision of a prospective freshman visiting the campus is highly influenced by what real estate people call "curb-appeal". Needs to be a greater sensitivity to public visibility of the campus as well as the arrival experience to the campus. Landscape quality, including site amenities, seating areas, lighting, signage, have all taken on greater importance in the buyers' market. This can have a positive impact on retaining students, faculty recruitment and on-going cultivation of alumni.

The visible campus is echoed by an invisible campus: an array of utility pipes and cables that heat, cool, power and communicate between the buildings. The characteristics and conditions of these critical and expensive systems must be thoroughly understood to make good decisions about the visible campus. In the sense that "right-sizing" implies improving the efficiency of the institution's operations the optimization of the systems that "energize" the campus are critically important. The master plan serves as a tool to that end.

Conclusion

Determining the "right" size for a campus, as if it would be fixed, is a misguided goal. The true essence of right sizing is improving the facility alignment — the fit between the functions and the space size and quality of spaces. In the process new facilities may be proposed and existing ones discarded. Space may be reassigned from one department to another.

At one university it was established that the science departments had been grossly oversized in the seventies in a building project that was not rigorously programmed. Compared to the normative standards the Biology department was nearly one hundred percent larger than the nearest peer institution. The administration chose to reassign some of the excess and also translate the fact into a marketing advantage by promoting the quality of the laboratory space available for undergraduate research.

Whether your institution is in a growth mode or is adjusting to a shrinking market, a rigorous master planning process is the best means to achieving suitable alignment of facilities to needs. The master plan for "right-sizing" will represent a coordinated set of actions concerning re-deploying facility assets to meet the strategic goals of the institution. The feasibility of the actions is established in terms of project scope, cost, and time.

At its essence "right-sizing" of facilities is simply on-going and responsible asset management.

Creating A Picture Perfect Campus: The Successful Campus—Look Good or Look Out!

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As a firm specializing in the design of college and university campuses and therefore vigilant observers of trends affecting them, we find ourselves asking one question with increasing frequency: Why is it that responsibility for the image of campus is so often delegated to photographers? If you find the question odd, try picking up the promotional brochure, catalog or video your school sends to prospective students. Look carefully at the pictures used to sell the school. It's a pretty sure bet that, regardless of whether you're at a small liberal arts school, a large university or a community college, your prospects will see a version of what has come to be recognized as the American College Campus: impressive architecture in a park-like setting. They'll see venerable "Old Main," a fountain if there is one, and students studying and socializing on broad green lawns under the leafy canopies formed by mature trees.

But do the campuses of most institutions really look like that? Or are they relying on some creative photographic editing? And why does an issue that boils down to image really matter, anyway?

Putting aside for a minute the other equally valid arguments that can be made in favor of the well-designed campus — reflection of academic excellence, protection of an often huge capital investment, functional efficiency, the legacy left to future generations and more — the importance of image can be captured in one word: *competitiveness*. Each and every institution of higher education in this nation competes in some fashion for prospects, not just for students but also for faculty and staff. And the facts point out that the more appealing the campus, the more successful the school in meeting its recruiting goals. When the Carnegie Foundation for the Advancement of Teaching surveyed high school seniors on how they chose their college or university, they found that the campus visit was the most important deciding factor. And when they asked what influenced them most during their visits, 62 percent responded, "the appearance of the buildings and grounds (Boyer, 1985)."

The irony of the situation is that while the top schools obviously understand competitiveness and recruitment issues, many other institutions seem to be only marginally aware of what tremendous resources their campuses really are. The admissions people realize it; they're the ones responsible for the brochures and videos. Meanwhile, the images they include in their mailings, the images people respond to, become less and less representative of the actual state of the campus.

Part of the problem, no doubt, is that the contemporary campus is rarely perceived as an entity unto itself and worthy of the care and attention devoted to every other aspect of the institution. But the campus is more than just the space left over between buildings; it is the rational organization of outdoor spaces and systems and everything they include: pavements, walls, fences, lawns, trees, shrubs, utilities, irrigation, signs, furniture, lighting and structures. The campus is the fabric that weaves the physical institution together: It's the first thing people see when they enter the school; it's the image they carry when they leave. It's where students and faculty mingle and where you find the center, the heart, of the institution and the setting for so many collegiate activities.

One of the most effective tools we have developed over the years to aid schools in understanding and shaping their campuses is the campus assessment. Essentially, an assessment is a clear and concise means of evaluating the character, condition and maintenance of the college or university campus, comparing those findings with the mission, objectives and budget of the institution and, *most importantly*, taking action to bring the former in line with the latter. We have found that it is a rare campus that cannot save money and show dramatic improvement as a result of this objective process.

Trends In Campus Development

The traditional campus, the one featured in the brochures, is a result of the mission shared by most American colleges and universities from the founding of Harvard College in 1636 until the early part of this century. Since that time, though, the nature of higher education has been changing dramatically, not only as a result of the social, economic and technological forces which have affected all of society, but also due to deep-seated debates about just what the mission and values of the academic community should be. The balancing act involved in designing campuses today results in large part from efforts to reconcile the campus in its traditional form with some of the more recent trends in college and university development. What follows is a brief list of several of the trends which are impacting the physical development of college campuses.

- New buildings, such as student unions, are getting larger and larger as schools attempt to gather more functions under fewer roofs, causing shifts in circulation routes and gathering spaces throughout the entire campus.
- Transportation issues, especially the provision of adequate parking, have increasingly come to dominate the form of the campus.
- Satellite campuses, being both physically and functionally removed from the parent institution, have tended to blur the physical separation between the college and the surrounding community.

- **Piecemeal development**, a reality of current funding practices, focuses design efforts on individual buildings or segments of the campus while tending to obscure the nature of the campus as a whole.

Shrinking budgets affect the campus. Our work with school financial officers has led to the observation that for every \$100.00 spent on the physical plant of an institution, over \$97.00 goes to the construction and maintenance of buildings, leaving less than \$3.00 for the rest of the campus - often the first area considered for budget cuts and the least able to absorb them.

While the effects of these trends can be far-reaching, there is nothing about them that is inherently damaging to the American campus as *long as* those effects are clearly understood by all involved. And since trends such as budgetary restraints are obviously not going to go away any time soon, it is self-defeating to ignore them. The point we would make is that in this context it is more critical than ever to have a clear understanding of your campus and rational goals for its development. The assessment provides this basis for informed, coherent decision making.

Loss Of A Coherent Campus Image

Ironically, in their efforts to accommodate these trends or to mitigate their effects, many schools have created more problems than they have solved. Past assessments have revealed a number of these issues which, when considered individually may seem harmful but not necessarily debilitating. But when they occur in combination, as is so often the case, the results can be profound and irreversible — the loss of a coherent campus. Among these issues are:

- **Parking vs. Campus:** Many schools have responded to increased demand for parking by simply paving large amounts of campus open space. In doing so, they tend to regard "campus" and "parking" as mutually exclusive entities instead of considering parking as *part of* the campus and subject to the same values and standards as the rest of the institution. It is possible to create campus parking that is convenient and efficient yet which complements the visual character of the campus; it simply requires a careful and knowledgeable effort.
- **Inappropriate Design Model:** Despite almost universally-held good intentions, but in the absence of a clear understanding of the design concepts that have guided the development of their campus, many schools fall back on the development model they see becoming the norm everywhere else: suburban commercial development. It's sadly true that were you able to render all of the buildings on any given campus invisible, practically anyone could still identify those built within the last ten to twenty years simply by observing the design of the surrounding campus, especially the use of plant materials. Many older schools have recently abandoned the long established practice of primarily using mowed lawns and large trees in open, unpaved areas. Shrubs used to be employed sparingly, reserved for important spaces and purposes. Now buildings, regardless of location or relative importance on the campus, are often surrounded by seas of flowering shrubs, bulbs and annuals in an attempt at horticultural display. The result, aside from a tendency for newer campus plantings to look identical to those at the local shopping mall, is an erosion of the spatial hierarchy so crucial to overall campus legibility and function. It's also a pretty sure bet that no one is taking promotional photos of these areas.

- **Breakdown of the Overall Organization of Spaces:** Well-designed campuses possess a clear sense of spatial order and hierarchy. There should be a well-ordered sequence of spaces, each possessing a special character which defines its importance in relation to the rest of campus. There should also be a definable center to the campus. When someone says, "Meet me in the center of campus", no further explanation should be necessary. Unfortunately, many schools have seen this spatial clarity eroded by new development to the extent that their campuses have become merely collections of unrelated spaces.
- **Confusing Circulation:** A byproduct of the loss of spatial clarity is that circulation on many campuses is confusing to visitors, especially prospective students. The moment prospects and their parents arrive on campus, they subconsciously but invariably subject the school to what we've come to call the "moment of truth" test, asking "Is this a school I admire, where I can imagine myself fitting right in, or is it simply a visit to be endured before moving on to the next one?" Favorable first impressions are often lost at institutions which do not have a clearly defined entrance and obvious paths to such important destinations as the admissions office and the center of the campus.
- **Inconsistency in Materials and Details:** In the rush to try new materials which may have lower installation costs, the long-term benefits and life-cycle costs of the materials traditionally used in the construction of campuses are often ignored. The result is a mish-mash of elements and materials, many of which are not cost effective. The campus and its associated appointments — walkways, lights, bollards, benches, trash receptacles, etc. — should instead be viewed in much the same manner as though they were a building, with a consistency of materials and design carried throughout.
- **Hard-to-Maintain and Short-lived Plant Material:** Most schools have no trouble thinking well into the future when it comes to their academic missions. In fact, they pride themselves on their history and their desire to take the long view when addressing academic and planning issues. Yet, for all of their foresight in other areas, the trees that they plant increasingly tend to be of the shorter-lived varieties, yielding immediate visual impact but representing poor long-term investments. Over 75% of the trees planted on campuses today have a life expectancy of less than thirty years. What's more, these trees often have far higher maintenance needs than do most longer-lived species. But even short-lived ornamental trees can look like bargains when compared with the shrubs, perennials and annuals mentioned earlier, all of which require greater amounts of labor and products such as fertilizer than do either lawns or trees.
- **Inadequate Maintenance:** Many campus spaces are never designed with an eye to the time and money required to manage and maintain them. As a result, they can easily overwhelm the resources of the physical plant staff, negate the effectiveness of what otherwise might be an exemplary design and harm the school's image by appearing unkempt. Another facet of the budget problems that habitually affect campus maintenance is that many schools react to budget cuts not by changing what they do but simply by doing less of the same. An assessment can point out inefficiencies in maintenance and identify where available resources can be redirected to do more with less.

The Solution: The Assessment

The beauty of the campus assessment is that it allows the opportunity to look at a campus and the pressures it faces with a fresh eye, and then to direct design and maintenance efforts in the directions which make the most sense for that particular institution. One manner we often use to describe an assessment is to characterize it as a clear and concise "State of the Campus Address" which recognizes the campus as an entity, the rational organization of diverse activities. An assessment evaluates what is being done right on a campus and shows how to build on those strengths as well as presents a plan of action to right those practices which may not support the goals and mission of the institution. And equally important, it saves money by laying out how the school's limited resources can be used most efficiently.

Crucial to an understanding of the assessment is the recognition that it is a different animal than a master plan and serves a different purpose. The master plan, which we also prepare, is a means of projecting and guiding future capital development while the assessment focuses on past and especially current practices as a tool for improving the existing campus. While most master plans include at least a perfunctory survey of the current state of the campus, they are not intended to go into the depth allowed by an assessment and should not be seen as a replacement for one. We have in fact come to recommend that an assessment precede initiation of a master plan in order to give the latter document a fuller understanding of a campus before looking into the future.

One additional distinction between assessment and master plan: COST. While a recent article put the cost of a master plan at \$30,000 to \$100,000 and up, depending on the size of the school (Biehle, 1991), a campus landscape assessment will yield information that is immediately useful for roughly one-third to one-half those costs. An assessment should, in fact pay for itself in a relatively short period by reducing maintenance and management costs as well as by preventing costly mistakes in new development. More importantly, the assessment will pay direct dividends by guiding the process of creating and maintaining a first-rate campus, bringing all of the attendant recruiting and fund-raising benefits documented in any number of studies.

Process

In its most complete form, a campus landscape assessment can take three to six months or more to perform. Whether going through the full-blown process or an abbreviated version, there are a number of steps that we follow without fail:

1. **OVERVIEW:** We become familiar with all of the spaces on campus and the operations required to maintain them, then dig into the school's archives in order to locate any material which could detail the development of the campus and impart a historic perspective to the issues which have affected its growth.
2. **ISSUES AND GOALS:** We verify the school's mission and ensure that all those affected (staff, students, faculty, alumni) affirm its continued relevance. We also ask them to flesh out the values and goals which are important to the institution, especially those which have a determining effect on the physical form and function of the campus.
3. **INVENTORY AND ANALYSIS:** We evaluate the elements which make up the campus: pavements, plantings, lawns, lighting, walls, fences, site structures, utilities, irrigation,

signs, furniture and any others. What contributions do they make to the campus? Do they enhance or detract from its mission? What materials are used to construct them and are they of good quality? A parallel investigation looks at the manner in which all of these elements are organized into systems and spaces, and what *types* of spaces are created: Entry? Central? Circulation? Service? Are there any other strengths or weaknesses which need to be addressed?

4. **ARBORICULTURE ASSESSMENT:** Because of their size and longevity, trees play a key role in campus design. We often include in the assessment a thorough examination of the major tree's history, condition, location and species. This information will lead to a tree maintenance plan that outlines specific actions to ensure that the existing trees make the maximum contribution for as long as possible.
5. **MAINTENANCE AND MANAGEMENT:** Keep in mind that maintenance and management are probably the most overlooked components of campus planning and design. This phase of the assessment includes a review of the maintenance equipment, staff and programs. How is staff organized; what procedures are followed; how can finances be allocated most efficiently?
6. **ALTERNATIVES:** We postulate a number of actions that can be taken in order to address the strengths and weaknesses identified earlier. We forecast the impacts those actions will have and help decide which will *best* do the job. We determine what will they cost in both dollars and staff/crew time. And, perhaps most importantly we revisit the goals identified in the initial stages of the assessment in order to make certain that they are satisfied by the proposed actions.
7. **GUIDELINES:** This is an optional step in the process. It involves creating a set of guidelines for the future design of the campus elements and spaces analyzed in Step 3 above. The idea here is to clearly articulate how the school's mission is translated into physical form and how that should be performed in the future in order to prevent reoccurrence of any problems found in the assessment. While this step starts to bridge the gap to a master plan, it stops short of recommending the specific capital developments a master plan would cover, functioning instead as a yardstick against which those developments may be measured.
8. **ACTION PLAN:** It is absolutely imperative that everyone involved remember that the assessment is first and foremost a working document. The recommendations it contains will improve the campus and will save the school money, but only if it is used on a daily basis. That's why we craft it to be concise, practical and directive. What are the final recommendations? What priority should be assigned to each? When should each be done and what will the cost be? Who should be responsible for taking action? How should they go about taking action and what considerations do they need to keep in mind as they do?

Some Final Thoughts

The campus landscape assessment is an essential tool, and one from which any institution can benefit. In a way, an assessment can be viewed as an opportunity for a school to live up to

its own expectations, to allow all of its grounds to be as rational, functional and appealing as the images portrayed in the catalogs. In the words of *San Francisco Chronicle* architecture critic Allan Temko:

"For it is on the campus, as virtually nowhere else in the country, that architectural permanence, rational organization of diverse activities, generous provision of open space and a liberal respect for the arts and sciences... can be seen acting together to provide an organic milieu for civilized life. The campus, at its finest, embodies principles of design which may be fruitfully employed throughout our civilization" (Temko, 1993).

Is this a picture of your campus?

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Human Resource Management

Linking Supervision to Organizational Success

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Introduction

One thing that each of us can count on from our organizations is change. In the short-term and in the long-term, we will all be doing things differently to respond to changing organizational dynamics and requirements. A word of advice to anyone who believes they can continue to run "business as usual." You are doing yourself and your organization a disservice. The most effective organizations are those that are "future-focused" and adaptable and that means that the people in key positions in those organizations must have the qualities of being "future-focused", adaptable, big picture thinkers and effective in their key positions.

Overview

The Smithsonian Institution's Office of Plant Services (OPLANTS) is utilizing a variety of human resources and management initiatives to improve leadership, quality, customer service, productivity, teamwork, recognition, performance and supervision. As the organization changes to become more responsive to customers and adapting to increased expectations with decreased resources, supervision has been focused upon as being one of the most critical links between front-line employees and senior management in achieving organizational goals and assuring staff are led and treated as the most valuable contributors to OPLANTS.

To give you a brief overview of the Smithsonian, we are an Institution dedicated to research and education and we face many of the same challenges your colleges, universities and other educational institutions face. OPLANTS' staff of 400 maintains and repairs the physical plant of the Smithsonian, which is about 5.5 million square feet of space located primarily in Washington

DC. We also maintain facilities in Florida, Massachusetts, New York, Arizona and the Panama Canal zone.

Background

Changes We Face

Several years ago, OPLANTS of the Smithsonian Institution began looking more seriously at our future. We were trying to focus on preparing ourselves to manage our organization better in what had the potential to be some turbulent times. Typical of support organizations, OPLANTS had internal and external customers who expected a high quality of service delivery and responsiveness; yet additional resources to accomplish our mission were not likely. Not only were additional resources unlikely, it appeared that there may be diminishing resources to meet these increasing expectations. We were also faced with a workforce of which 25% were eligible for retirement within five (5) years, the retirement of our director, who had been in the organization for over fifteen (15) years, a new Secretary of the Smithsonian, the potential for political changes in Congress and outdated performance expectations of most employees.

Although these changes may sound grim, we began taking steps to address how best to keep OPLANTS functioning during these challenging times. The arrival of our new director brought many changes and some turmoil as the organization tried to adapt to new leadership and new leadership began to exercise its influence over the organization. This is normal because new leadership and changes in organizational philosophy are always accompanied by anxiety and stress and they represent change that disrupts the normal routines. We looked at how supervisors could help us through these difficult times. We discovered that we needed to reevaluate how we could utilize supervisors better in OPLANTS' leadership.

Challenges We Face

Several years ago we began to get more involved in strategic planning and determining our organizational vision and looking at what we expected of our employees. As we became more focused, we clearly needed to make some changes at all levels in the organization. We decided that the more first line supervisors know about the mission and vision of OPLANTS, the better prepared they are to handle and help facilitate these ideals. We realized that all these changes would have a "cascade" effect and that first line supervisors are one of the most critical players in the process of improving organizational performance.

The change from technician to supervisor is often difficult. One is suddenly faced with a new set of expectations that require unfamiliar skills. A new supervisor suddenly becomes responsible for assigning tasks, planning work assignments, scheduling employees' duties. He or she must teach employees, clarify expectations of employees and discipline employees. He or she must schedule people and leave, write performance standards and evaluations and compose position descriptions. The new supervisor, moreover, must accommodate individual employee's needs and quirks. All the while she or he is trying to work with more senior management to assure that their requirements as well as the organizational goals and vision are met. To do this, we needed to articulate our essential expectation of supervision and redefine it.

To determine how best to focus on redefining supervision, we conducted a needs assessment. The revelations from a well-conducted needs assessment help place an organization in the most beneficial position to introduce and facilitate change.

The outline below identifies the steps we followed in assessing our needs and understanding:

Step 1: Diagnosis

Like a good doctor, a good organization identifies the symptoms before diagnosing the problem. This process of identification is called a *needs assessment*; it specifies the root cause or causes producing the symptoms. We knew two facts about our organization:

- The organization depended heavily on supervisors to assure OPLANTS operated efficiently and effectively, yet;
- Many organizational problems stemmed from supervisors' inappropriate handling of situations.

In light of these two facts, we conducted a survey to ask senior management to describe their "ideal" supervisor to get a clear picture of what they expected. To measure how senior management's expectations coincide with what is legally expected of a supervisor vis a vis the position description, we conducted a thorough job analysis of each supervisory position in OPLANTS.

Once the job analyses were complete and the surveys tabulated, we began to synthesize our data to draw some conclusions or diagnose the problem. The two issues that our needs assessment identified were:

- The job (position) descriptions needed to be updated and modified to be consistent with senior management's expectations of supervision and
- OPLANTS five levels of supervision needed a training program that would provide them the tools to become highly productive and effective as supervisors and as leaders.

Step 2: Prescription

Once we had a completed needs assessment or diagnosis, we developed a treatment to cure the problem. We received the support of senior management to develop a training curriculum to address the vital responsibilities of supervision. We investigated supervisory training curricula instituted by private and public organizations. We looked at their structure, implementation process, management requirements to support a training program, cost and overall effectiveness. We knew that we wanted our curriculum to develop supervisors. We wanted it to present opportunities for the supervisor to grow and prepare for career enhancement opportunities.

The job analysis provided us with a list of the knowledge and skills our curriculum needed to consider. We determined the types of courses to incorporate into the curriculum. These ranged from basic writing to executive development seminars. After several revisions, our curriculum consisted of five tiers, one for each level of supervision in the organization at the time (this has been reduced since to three levels). We identified thirty-five (35) modules to support the five (5) levels, or tiers, of the curriculum.

Once the curriculum was developed we calculated the total amount of training hours required and the cost. This information was critical in selling our proposal to senior management. The final element of our prescription was the implementation of guidelines necessary for the curriculum to be successful, including the time necessary to complete the courses and an implementation plan.

With the tiers in place, it was time to determine who would provide the training. Given our limited budget, we had to find a cost-effective way to present training. We decided to use a packaged management training program for one-third of the curriculum, Smithsonian Institution training courses for one-third, and develop the remaining one-third of the curriculum internally.

Step 3: Treatment

With our prescription in hand, it was time to begin the treatment. The first part of the treatment would be providing each supervisor with their individual training profile. The profiles were a detailed description of the training each supervisor had completed during the last three years. The profiles were distributed for review and correction. Each supervisor was given credit for those courses that correspond with their tier of the curriculum so that they would be able to identify what training they needed to be in compliance with organizational expectations. The second part of the treatment is in progress, the implementation of the curriculum. All of the supervisors have been briefed on the curriculum and what courses are required to complete their tier. Implementation involves scheduling individuals for the courses related to their needs, as well as developing the remaining courses needed for the curriculum.

The third and final stage will be the creation and implementation of Individual Development Plans. These will allow the supervisor to decide how they want to tackle their tier and develop themselves in other areas. They also allow the supervisors to make some decisions on how they prefer to learn and grow.

Step 4: Cure

The quality of supervisors in an organization has a tremendous impact on organizational effectiveness. While there is no absolute cure for supervisory problems, we feel we can improve as an organization with a strong treatment plan. It will have its setbacks, but with constant monitoring and check-ups, our curriculum will produce highly productive supervisors.

Supervisors who are supported by senior management and other organizational leadership and provided with the training and the organizational infrastructure to carry out those clear expectations, will have a positive influence on organizational performance. Superb organizational performance does not just happen, it is made to happen by all of the players. Organizations need to make certain that they create and support a culture that assures the success of all employees since individual performance is the key indicator of organizational performance. The first line supervisors are a critical link to having organizations perform to their potential.

Linking Supervision With Success

After determining the goal of improving supervision, we began the process of changing the organizational infrastructure. Supervisory Position Descriptions (PD's) were reexamined in light of the many organizational changes mentioned earlier. Some PD's already represented senior management's expectations, but needed "pen and ink" changes to reflect our new organizational focus. Many of the older supervisory PD's, however, were written with a focus on the strong requirement for technical skills. The administrative chores warranted about one paragraph and focused primarily on tasks such as timecards and disciplinary actions. Since we had determined that our focus was changing, many of the PD's were rewritten to place a stronger emphasis on managerial and supervisory aspects. The major elements of the new PD's are managerial and supervisory; the technical requirements are still important, but do not receive the same focus as in the past.

The managerial and supervisory duality of the role is identified early in the PD as well as the importance and impact of leadership provided by this individual. The PD states that the incumbent "provide[s] input to and participate[s] in the development of plans and activities . . . to ensure productivity and cost effectiveness." The person in this position is a full partner in the success of OPLANTS and the Smithsonian Institution. Every effort is made to clarify those expectations to the incumbent and provide her or him with the support necessary to achieve success in this leadership role.

The PD goes on to state that the incumbent works ". . . together, with staff" and "serves . . . staff as both coach and leader." The manager "works cooperatively and supportively with other . . . staff to ensure an efficient and well-coordinated operation" and "meets managerial responsibilities in an exemplary manner." The old way of managing was to gain all the power by controlling events and only sharing information on an "as needed" basis. The new way is to gain control over events by giving team members more power through the sharing of information. The PD, then, serves as a blueprint for the incumbent (or potential incumbents) to understand clearly the full scope of responsibilities associated with the position. We want our supervisors to understand that they are the coach of their team. Good coaches don't win games by themselves; they pick good teams, train them, communicate well with them, equip them well, foster team spirit and encourage the team to keep focused on the ultimate goal. Those are the standards we want our supervisors to achieve.

Measuring Supervisory Performance

To be in concert with the new PD's, our next step was to outline how to measure the performance of supervisors. We needed to incorporate the new concepts in our PD's into our tool for evaluation, the performance plan. The new performance plans focus on leadership, guidance of staff and management of resources. One common mistake in many older performance plans was to try to anticipate every situation or consequence that could ever arise and then write the performance plan to that level of detail. What we are now focusing on is the basic expectations placed on the supervisors. In addition to "top down" measurement of performance plan achievements, we will also be using "bottom up" and peer measurement of achievements. This allows those who are actually carrying out assignments and making things happen to have a say in evaluations. This type of evaluation helps us keep our goal in mind.

The Importance Of A Strategic Plan

It is almost impossible to reach a goal unless the goal and how to reach it are known. Imagine deciding to go on vacation without determining a destination or how and when to travel. One needs to know where one is going, what modes of transportation are available to get there, where they originate, how much they cost and what sorts of obstacles one may encounter on the way there. To reach any goal, there must be a plan, since good fortune and spontaneity seldom endure.

The road map for the trip is an organization's strategic plan. In the past, senior managers wrote their mission and vision statements (presumably with input from their staff) as well as action steps to achieve their vision. They would work together to come up with the organization's strategic plan. While we thought we were fairly successful at this, some change was needed. The strategic plan must not belong just to the senior managers but to each staff member. To do this, we have established a strategic planning team that is headed by a senior manager, but includes people from all levels in OPLANTS. This is new for us and we have not yet gone all the way through the cycle yet. We are making great headway, however, in the development of a strategic plan with the participation of a representative group of employees.

Organizational Change

All businesses face incredible changes right now. Every organization is expected to do more work with reduced resources and still meet quality standards. In the past, a strategy for accomplishing more work would be to keep track of the work so that the increased workload could be used to justify increased staffing levels. Good management does not result from such simplistic solutions. To respond to challenges, an organization must seek and evaluate ideas and alternatives and encourage the participation of those who actually carry out the primary tasks. The organization must put creativity and support of staff up front, along side of the organizational mission and vision. When people know what the goal is, what their role is and how much support is available then things get done well.

One need not despair if the active and involved culture mentioned above does not sound familiar. The challenge of modern leadership is to begin making the changes that will better serve the organization and its whole staff. It will not be easy to change an organizational culture and it will not happen overnight. Listed below are some key areas to focus on that will enhance one's opportunities for success:

Supervisory Culture

One will seldom get the best supervision if supervisors have a narrow interpretation of their responsibilities. If they are technical experts but don't participate in demonstrating versatile leadership to their staffs, then the organization is not going to get the most for its investment in them. Conversely, if they are "big picture" people who can't make things move and get accomplished, then the return on investment is also not as good as it could be. A blend of the technical and the "big picture" is necessary. One should seek as supervisors those who are adaptable to changing situations and capable of seeing many sides of an issue. One also should be certain that they are

not afraid to delegate to others (who may have more technical knowledge) or solicit different perspectives.

Organizational Culture

It is critical to align the organizational culture with whatever changes are wanted. If the changes are discussed but not done, expect staff members to believe what is done, and discount what is said. Consistency is the key and it is more important to make the right changes than it is to talk about them. An organization performs best when everyone knows what is expected of them and the infrastructure and culture support the expectations.

Dealing With Resistance

Expect resistance for it is human nature to look upon change, whether it is positive or negative, as bad. Change removes people from their comfort levels and routines; it introduces an element of uncertainty. Change is particularly disconcerting when people define themselves in the context of their job and then their job changes. One of the most effective ways of reducing resistance is to let people know that change is coming, what it is likely to be and help them through the change by involving them in it. People normally react to change by experiencing denial, anger, resistance and, ultimately, acceptance so bear this in mind when shepherding organizational change becomes frustrating.

Rebuilding Trust

Change is generally accompanied by the erosion of trust and a sense of betrayal on the part of those most affected. It is important to work with staff to maintain open lines of communication and talk through their issues. This may take longer than you think it should, but look at the time and effort involved in rebuilding trust as an investment in improving your organization and making it more productive.

Diffusing Anger

When people feel the status quo is threatened, they feel like they are losing control and this sense of losing control is usually accompanied by anger. Although things may appear to be relatively normal, anger can be expressed in a variety of ways:

Passive-Aggressive Behavior

Although the effected employees may appear to be passive, they may be engaged in bad-mouthing, rumor-spreading, sabotage or griping far enough behind the scenes that they may only appear to be harmless.

Denial or Withdrawal

People may feel that, if they do not acknowledge events, the events may go away. Sometimes this strategy works as a short-term way to deal with turmoil, but it easily can become unmanageable.

Power or Dominance

This kind of coping mechanism results in winners and losers and seldom benefits the organization in the long-run.

Extreme Accommodation

Sometimes people go way out of the way to accommodate uncertainty and their accommodation may actually result in negative consequences for the organization or for individuals.

Involving Employees

To assist employees and the organization in coping with change, OPLANTS has worked closely with the Smithsonian's Employee Assistance Program (EAP). We developed a change management seminar and offer individual and group meetings with EAP counsellors. The two-hour, Change Management seminar helps employees identify the changes affecting them and the feelings associated with those changes. The goal of the seminar is for employees to understand what is causing them stress, fear, anxiety and/or anger. During the seminar they are given tips or pointers on how deal with change and the stress it may create. This is only the beginning of OPLANTS' collaboration with EAP to provide our employees with the support they need to manage the changes affecting them individually and the organization as a whole.

As some new opportunities are created in OPLANTS and some work situations change, we worked with the Office of Human Resources (OHR) to develop on-going classes on how to prepare a résumé and prepare for career opportunities. Subject matter experts work with small groups of employees, offering advice on how to prepare a résumé in light of personal career objectives.

Customer Service

Because we have customers within and outside of the Institution, we are shifting our focus more to the customers we serve. This is an important movement or focus for OPLANTS and we are working very hard in the arena of customer service. We currently have a Customer Service Team that is developing and implementing customer service initiatives, such as improved customer relations, telephone techniques and training. We also have a team of volunteers who will be implementing a two-day Customer Service Awareness Training program to introduce customer service and provide the groundwork for future Customer Service efforts in OPLANTS.

Communication

Another focus is improving our internal communications. We have attacked this problem within OPLANTS from a variety of angles. We have a quarterly newsletter, *THE PIPELINE*, that provides all OPLANTS employees with current information on the changes occurring in the organization, as well as other newsworthy information employees may want to know. In addition to *THE PIPELINE*, we publish a supplement as needed on the major changes affecting OPLANTS to keep employees as informed and up to date as possible. The Director instituted quarterly TOWN MEETINGS for all of our employees to attend to voice their concerns and receive current information about what's happening in the organization. We also put up bulletin boards in high traffic areas for the organization so employees have the opportunity to receive information from a variety of sources.

To keep our supervisors as informed as possible OPLANTS has used the above mentioned methods, as well as a monthly supervisors meeting with the Director, weekly meetings with Assistant Directors, consistent E-Mail information sharing, and active participation in decision-making and team involvement.

Including Supervisors

The needs assessment for OPLANTS determined that we wanted supervision to become more adaptable, stronger, clearer, more equitable and more of a vehicle to deliver support to employees and customers. We are following up on our goals by assuring that the infrastructure of OPLANTS supports our supervisors and helps them achieve those objectives for their own personal benefit as well as the benefit of OPLANTS and the Smithsonian Institution. The more people feel they are part of (or aware of) change the more emphasis they will place on the goals of the group. This feeling of collaboration should be one goal of engaging your staff in initiatives, rather than having them feel victimized. As the key links in your organization between front line employees and senior managers, much of the organization's success is the direct result of supervisory efforts. Be sure to align the organization so supervision is given the appropriate recognition and support to help the organization become successful.

Conclusion

The success of any service organization depends on its ability to serve its customers. This service requires that all management and all staff work together to establish, foster and maintain a two-way flow of information, resources and support. The integral link between senior management and staff is the first line supervisors. First line supervisors are the conduit through which all the necessary information and ideas are passed to senior management and through which the vision and inspiration of senior management are passed to the staff. Our training program for first line supervisors is still in its first stages. It, nevertheless, has begun to yield new insights into importance of the link between supervision and organizational success.

Practical Employee Recognition Promotes Greater Productivity And Achievement

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Executive Summary

Our goal is to formally recognize the performance we most want to be repeated (the best work). We use recognition and feedback to help our general staff employees build their performance and help our supervisors achieve continuous improvements in productivity, reliability, quality, and worker/customer attitudes.

We developed skills in evaluating and documenting performance in measurable terms (quality, quantity, and timeliness) and subsequent impacts on the customer. Performance must be observed by the supervisor or customer to be helpful evaluating performance to give constructive feedback.

We supplemented policies: require written monthly recognition of at least two examples of each general staff employee's best work and provide semi-annual one-on-one feedback.

We benefitted from improved employee attitudes and performance. Annual appraisals were simpler—employee's monthly recognition helped justify higher ratings for top performers while clearly showing the adequate performer. Feedback documentation also identified supervisory strengths and weaknesses.

Introduction

Texas Christian University (TCU), founded in 1873, has grown from a small school on the cattle frontier to a major center of higher education. As an independent teaching and research institution, related to the Christian Church (Disciples of Christ), located in the heart of Fort Worth, we—faculty, staff, students, and trustees—are united in striving for the constant improvement of the University.

TCU exists because of its dedication to learning and commitment to rationality, objectivity, diversity, freedom of inquiry, creativity, and civility. The heart of these values are people, free and responsible, who voluntarily commit themselves to share the work and rewards of TCU. Every individual has the ability and choice to augment or diminish TCU's mission through every action, interaction, and decision.

The Mechanical/Electrical Systems Group provides skilled support to the Physical Plant Department which on a much larger scale supports the mission of Texas Christian University. The Physical Plant Department directly supports the Vice Chancellor of Administrative Services through its mission to operate, maintain, repair, and restore the real property and systems servicing the real property managed by TCU. The primary objective is to provide and maintain a safe and healthy physical environment conducive to academic excellence.

Both the Director of Physical Plant and myself are retired Air Force Officers. We both have been drivers in achieving the Air Force Installation Excellence Award, awarded annually to the best Air Force Base. Our commitment to excellence and teamwork is shared by our staff and co-workers at TCU, and is evident throughout the campus.

I started at TCU in January 1993. My task was to lead a group that suffered from management and morale problems. I became the third director in 3 years. Motivation and morale were very low and feedback was overwhelmingly negative. Amid frustrations and resentments, I sought to heal hurts and restore the group's sense of ownership and pride in the work and systems maintained for TCU. I modified and implemented recognition techniques that I tested and proved in partnership with Mr. Robert (Bob) A. Stephenson in Civil Engineering Operations at Altus Air Force Base, Oklahoma.

Most of the ideas that follow were derived from over 20 years of personal experience and training in the Air Force, and developed to help our organization at the University.

Background

Custodial and maintenance work is driven by negatives and dissatisfaction. In Custodial work, nearly every comment about such work highlights the shortfalls rather than appreciation for the regular and consistently satisfactory performance. In maintenance, nearly every customer serviced on a short notice is already dissatisfied and readily blames the worker for the problem the worker solves for them. The key to survival becomes keeping complaints as low as possible. Fear of failure is the primary motivator.

Supervisors of custodial and maintenance work perpetuate fear motivation and enforce "status quo" or compliance with traditional methods and procedures. One supervisor will say, "Workers aren't paid to think; they are paid to do what they are told." Another may say there was no room for creativity. Upon being challenged as to whether the employees are stupid, this supervisor may project absurd examples of employee creativity. These attitudes are not unusual of top craftworkers who are promoted into supervision. Supervisors will follow tried and proven procedures because they, themselves, continue to be primarily motivated by fear of failure.

Traditional methods and procedures prescribe what individuals should be capable of doing, but severely limit what self-motivated or clever individuals can accomplish. By moving people from "fear of failure" to "desire for achievement", their discretionary efforts or internal "dynamics" can become a major factor in their morale and productivity. Teamwork and synergism are achieved naturally at the worker level when workers share common desires for achievement.

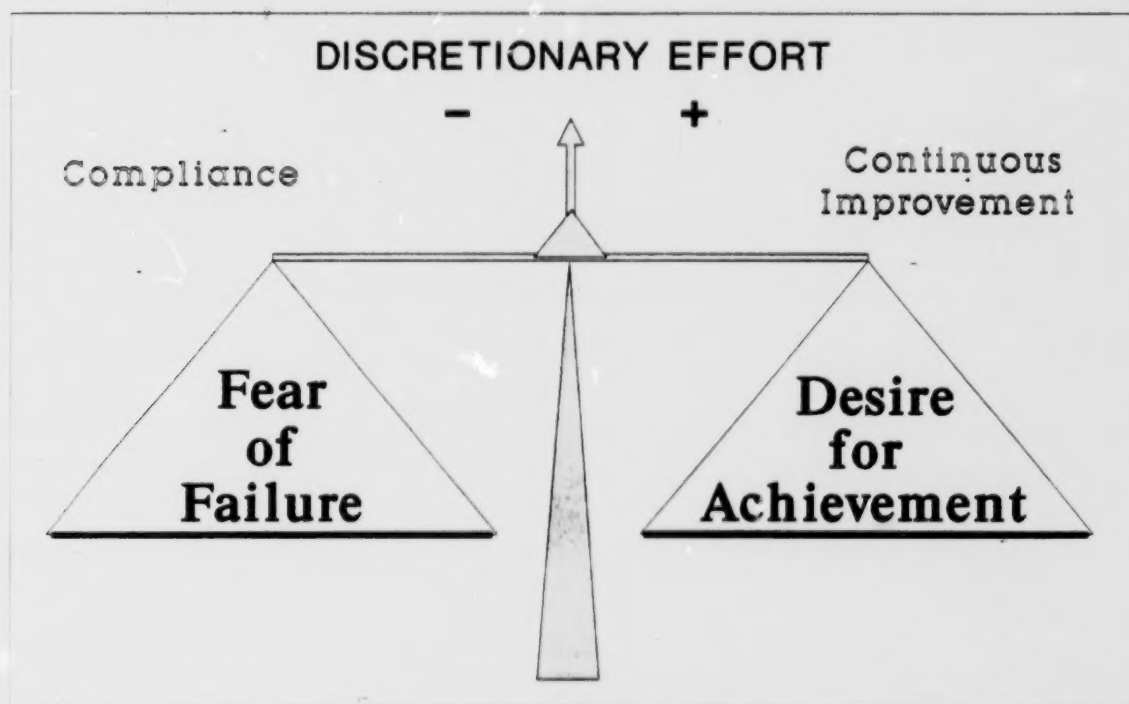


Figure 1. Motivation Balance.

It is difficult to achieve high levels of desire for achievement in a highly negative and restrictive environment. I developed the list of questions that follow to provide a test for negativity in an organization's culture.

Test for Negativity in Organizational Cultures:

- Which gets recognized most, minor failures or minor achievements?
- Which is practiced more, criticism or praise?
- Which are more significant, efforts to reward or efforts to correct?
- Are conflicts viewed as avoidable problems or unresolved differences?
- What is the immediate reaction to a customer's complaint about an employee, how does this differ from a customer's appreciation?
- What work is demeaning and who does it?

Do the answers to the above questions reinforce fear of failure or desire for achievement?

Historical or cultural negativity cannot be changed quickly. I developed the following balance to suggest that motivation can be managed by working to decrease the fear and to promote the desire for achievement.

Using the balance in Figure 1 and influencing the answers to the test for negativity will also help change the management culture and its impact on motivation.

Most people want to be successful. Most people understand what must be done to avoid failure, however, many do not know how or what to do to achieve success.

The ABC Behavioral Model suggests that the desired behavior or performance can be achieved by managing the Antecedents and Consequences. A modified approach to the ABC Model (Figure 2.) has the desired behavior or performance as the gap between the present state and future goals. The employee succeeds when the gap is bridged or filled with desired behavior.

Education and training may be needed on the desired performance and behaviors. Often it only requires oral or written instructions on what must be done. The performance behavior or consequences will give evidence of the effectiveness of the antecedents. When performance and behaviors are voluntary or discretionary, the consequences will either encourage or discourage repeated occurrences.

In an organization that has a negative culture, needs for compliance and avoiding failure provide consequences that will naturally curtail initiative or innovation. These consequences must be managed to promote innovative and intelligent performance.

The gap can be ordinary or scheduled performance, required improved performance, or new and innovative performance. Breaking larger tasks into smaller defined gaps can make achieving larger goals a sequential and achievable process.

In a service organization, levels of performance vary by individual across the organization. It would be foolish to give everyone the same goal or require everyone to give the same performance. Compliance would be too simple for the skilled and experienced workers or extremely difficult for those acquiring the necessary skills and experience.

The ideal objective is to obtain best performances from everyone, and continuously identify with each worker the next achievable gap for better performance. This objective either requires every individual to be motivated by a desire for achievement or requires a sequence of achievable behaviors to be prepared for each individual and a mandatory compliance schedule that is

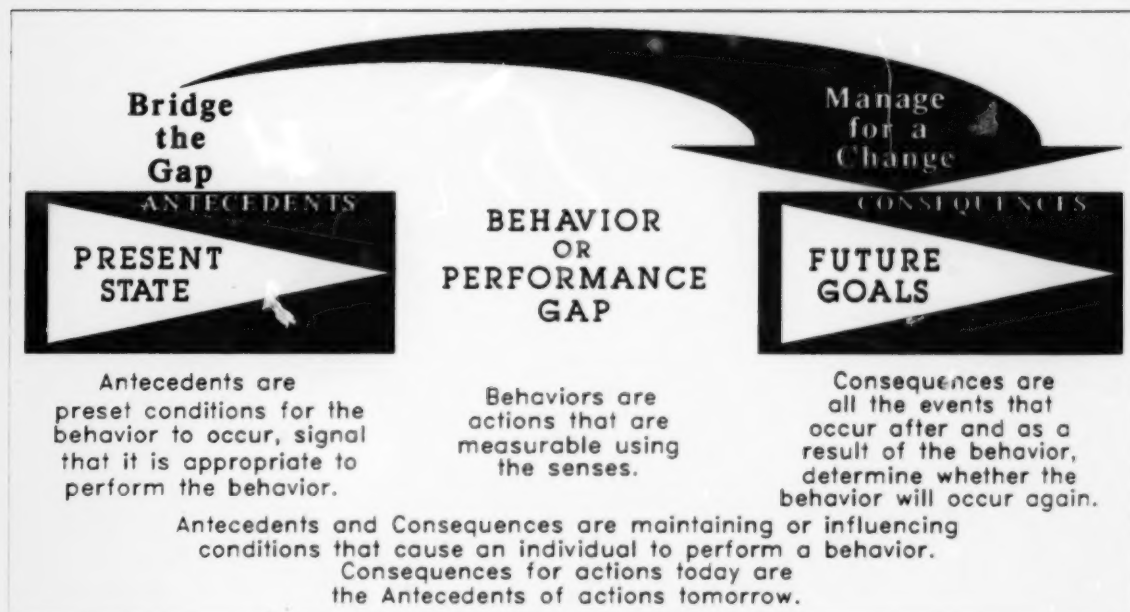


Figure 2. Bridging the Performance Gap.

strictly enforced. The latter is extremely laborious and tenuous, and far exceeds the existing skills possessed or sought in a first line supervisor.

Helpful customer/worker relationships provide recognition and support for achievement. In a higher education environment, fostering these relationships is difficult, perhaps because of the hierarchy inherent to the perceived differences in education. If helpful relationships are to develop, the worker must use initiative and discretionary efforts to do extraordinary things to help the customer.

Similarly, to maintain high levels of motivation and productivity, extraordinary levels of support must be provided to the front line service workforce to counter the negative culture and resulting fears of failure. This paper proposes a process of positive reinforcement through practical employee recognition.

Objective And Goals

Observing and evaluating performance and results is a key supervisory task. Recognizing performance of subordinates is the singularly most important step in encouraging outstanding performance and improving or correcting other performance. Employee performance recognition goals are (1) to formally and regularly communicate our best performances as the new standard to achieve and (2) to provide feedback, encouragement and specific guidance for continuous improvement.

Suggested Recognition Policy

It is imperative that all supervisors observe their subordinates' completed work and acknowledge that the results the customer desired were achieved in a timely and professional manner. It is also imperative to ensure that each job is completed professionally, in the minimum time necessary to accomplish all prudent activities of the job, and at minimum cost. Short cuts such as leaving off guards or electrical covers, or not cleaning up the work areas are unprofessional, and are considered unfinished work. Extra efforts to clean, polish, and paint within the context of a job must be strongly encouraged and recognized, as well as assisting customers with other problems or work requests. Prompt recognition is essential to achieving continuous improvement and desired customer enthusiasm.

Monthly performance recognition procedures: Each supervisor of a general staff employee must write at least two action-impact statements for each subordinate describing their best work and corresponding results. These statements are provided to the appropriate superintendent by the end of the last workday of the month.

Superintendents review, edit, and then forward them along with their statements to the director by the end of three workdays. These statements will be combined and published in a performance recognition report for the month that is posted on the bulletin boards and in the director's "brag book."

Resistance To Recognition Procedures

Expect early reactions to the above policies to be negative. The following statements characterize some of the probable reactions:

- This is dangerous, if we recognize them for doing good work, we won't be able to discipline them for bad work.
- My people don't need to be recognized to do good work.
- I don't have time for this foolishness (to write at least two action impact statements per month on each employee describing their best work).
- If we tell them they are doing a good job, they will become complacent and less productive.
- Why should I recognize their best work when it isn't even good?

Action/Impact Statements

See Figure 3 below.

Early Examples Of Employee Recognition

(Employee Action; Work Impact)

- Made two temporary 60 Amp power panels with 100 foot cords and installed them in the Student Center; enabled the "Battle of the Bands" to take place on schedule

ACTION STATEMENT	IMPACT STATEMENT
Use action words to describe what the employee did (behavior) that is an example of his/her best work.	Describe the impact of this action or accomplishment in terms of quality, quantity and timeliness on the mission, goals and objectives of the organization.
Avoid using names: refer to people by title or position only. Examples: - Helped Safety Director to... - Removed dead animal for Librarian..	Avoid being too general; be specific about the event. Example: ...corrected tripping hazard at top of stairs in the science building.
Be sure to indicate level of difficulty: - Crawled under building to locate and repair hot water leak.	...prevented costly water damage... ...stopped erosion of the foundation...
Be sure to indicate level of success: ...clamped and stopped leak promptly, scheduled replacement for summer	...kept customer inconvenience low... ...scheduled disruptive repairs during off-season

Figure 3. Guide for Action—Impact Statements.

- Helped co-worker install new coils in the Air Handling Units cooling the library's special collection; safeguarded historical congressional records and ensured comfort
- Assisted in cleaning 3" sewer line (in residence hall); restored lavatory use to nine rooms
- Serviced Direct Expansion Air Conditioning units at the stadium and coliseum; ensured equipment reliability for a safe and comfortable environment
- Cleaned and painted equipment and floor in the (residence hall) boiler room during scheduled preventive maintenance; prevented corrosion and provided professional quality appearance

Later Examples Of Employee Recognition

(Employee Action; Employee Impact)

- Along with regular tool crib operations, made bench repairs on several pumps; ensured prompt repairs and reduced work order backlog on shop
- Helped replace boiler tubes (in residence hall boiler room) and developed a new technique for pulling tubes; increased speed and efficiency of tube removal
- Assisted with repairs of heat exchanger (in residence hall boiler room); positive attitude contributed to speedy repairs and added to his knowledge of repairs
- Completed all required inspections of emergency generators; ensured all systems functioned properly and provided standby electrical power to (numerous facilities)
- Installed window units in (numerous Sororities') Chapter Rooms; provided comfort to "Rush Week" participants

Progression

Compare early employee recognition with the more recent recognition. Please note the subtle changes that are occurring in the recognition process. More and more the employee is being identified with the results of the work. Instead of the employee's work satisfying the customer, the employee is being recognized for satisfying the customer.

Such recognition is helping to strengthen the link between what the customer needs, what we are charged to do, and our growing commitment to continuously improve the quality, quantity, and timeliness of services provided by the Physical Plant Department.

Example Nomination Text

We are proud to recognize (employee) as our best employee of this quarter. ...has provided and supported outstanding teamwork, performance, productivity, and service to customers. ...was the best front line worker we had.

(Employee) has been an invaluable assistant in our efforts to improve preventive maintenance and service. ...led the effort to gather lighting and lamp data and to enter it into the computer. This was a key building block of the preliminary 5-year relamping plan that was recognized as needed for the whole campus.

(Employee) enthusiastically responded to the challenges of summer maintenance and has been motivated to accomplish the rigorous schedule. ...attention to detail and quality of work have enabled the summer maintenance crew to accomplish outstanding results in the dormitories scheduled for this period. ...has relamped, replaced numerous broken switches and receptacles, and generally ensured that the rooms serviced are safe and fully ready for another school year.

The following highlights recognition of (employee's) best performance:*

April 1994

- Collected data required to complete a 5-year relamping plan for dormitories, entered the lamp and fixture data on Lotus 123; completed plan promptly and produced outstanding documents
- While performing preventive maintenance on fountain, removed piles of grass that mowing equipment dropped around the fountain; created a more pleasant looking area for all to enjoy
- Organized cook-out; generated goodwill, camaraderie, and boosted the spirits of all employees

May 1994

- Provided excellent service and quality by accomplishing thorough maintenance at the three scheduled residence halls
- Assisted with relamping of various areas; provided quality lighting in corridors and study areas and reduced future lighting service orders
- Cleaned or replaced overhead diffusers, replaced burned out lamps and ballasts, improved the electrical devices by removing or repairing the duplex receptacles and plates, and improved the appearance of rooms by removing and replacing all mismatched or defective switch plates

June 1994

- Provided excellent maintenance while assigned to the summer maintenance crew; thoroughly checked each room, made repairs and ensured each is ready for occupancy
- Helped restore lighting and electrical service in 8 residence halls on schedule; improved the quality of lighting and appearance, provided more comfortable areas for returning students

**Aside: This employee had been nominated five times for employee of the month and won the honors in February 1994. Recognition helped build this employee's confidence to pursue and accept the challenge of management work. It was easy to prepare a letter of recommendation. This front line employee now works in another department as a management assistant.*

Suggested Performance Feedback Policy

Feedback sessions will be planned for supervisors to regularly assess subordinates' performance behaviors (what they do), recognize specifically what they do best, and provide guidance (specific goals) for continuous improvement. These one-on-one sessions with subordinates are

in addition to the Annual Performance Appraisals directed by the university. The sessions will provide additional factual information to more fairly appraise each subordinate's performance for merit pay raises.

Feedback will be given in March and September of each year, but may be more frequent to recognize improved performance.

The attached Performance Feedback Worksheet will be used to document the performance feedback session. The front side of the Performance Feedback Worksheet is used to graphically identify strengths and areas where improvement efforts are desired. Normal marks would follow a common vertical line indicating generally overall performance. The supporting comments should be action statements detailing specific actions or tasks that achieved the exceptional marks.

The back of the Performance Feedback Worksheet is for supervisor's and ratee's comments. These comments should confirm that communication and feedback has occurred, and that improvement goals are measurable and achievable.

The completed form will be submitted to the director for review and signature. When the form is returned to the supervisor unsigned by the director, the supervisor will make an appointment with the director to review the feedback together with the subordinate.

Performance Feedback Worksheets are tools used by supervisors and subordinates. The director will review each one to ensure each supervisor has fairly communicated performance expectations and that each subordinate has understood them.

Difficulties With Performance Feedback Procedures

Supervisors had difficulty, initially, describing work behaviors. They tended to characterize personality traits rather than describe subordinate performance behaviors and work results. This

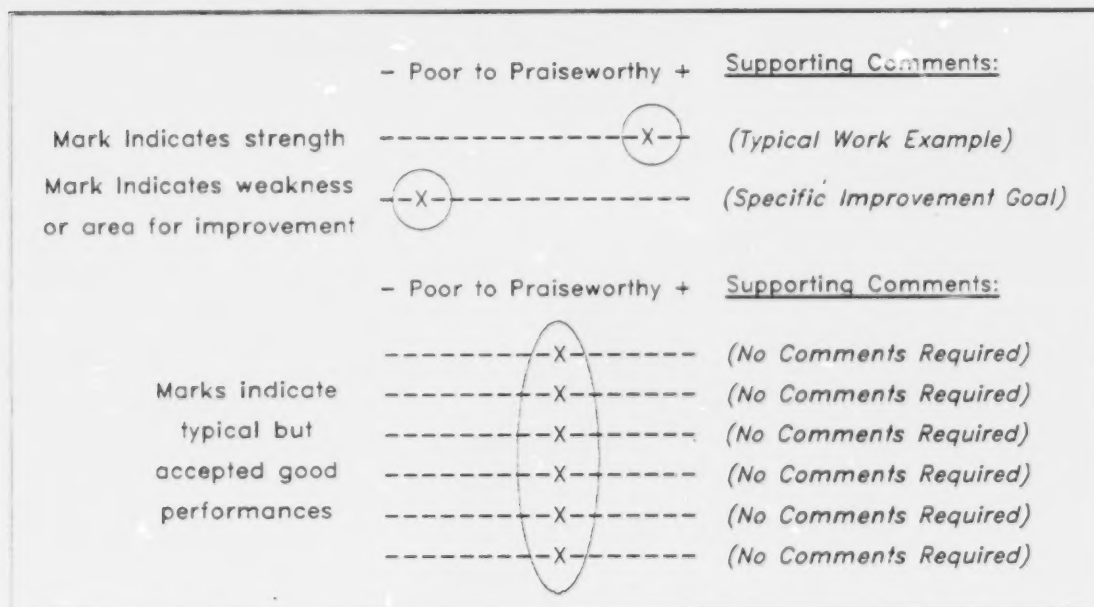


Figure 4. Guide for Marking Performance Feedback Sheets.

was especially true of supervisors who failed even occasionally to observe their subordinates completed work.

The feedback process requires the supervisor to build on the strengths of the individuals. Some supervisors have had difficulty in balancing strengths and weaknesses, tending to focus on weaknesses. For continuous improvements to occur, we must build the individual's acceptance for change by helping them recognize their successes and strengths, and by developing their confidence in their future success with a new skill or responsibility.

If improvement is not possible, the subordinate deserves a new supervisor who can see and provide possibilities for improvement.

Improvement goals must be specific and achievable. Goals to improve attitude or to improve productivity are too general. The improvement goal defines a new behavior or performance to be achieved in measurable terms. State specifically the measure of the improved attitude or productivity that is desired. Real progress will be made only if the supervisor and the subordinate (both) know what to do to achieve the goal.

There have also been problems correlating the front side of the Performance Feedback Worksheets to the reverse side. When suggesting goals, some supervisors tended to ignore the feedback on the front side, and focused on personal values—licensing, for example. Others lacked conceptual or writing skills to state clearly what improvements were desired.

The above difficulties are inevitable, however, once adequate training and coaching is accomplished, supervisors will be able to accomplish performance feedback sessions effectively.

Employee Recognition Results

Annual performance appraisals were supported by at least two Performance Feedback Worksheets for each individual, plus 12 months of monthly recognition statements. These documents enabled supervision to quickly review subordinate performance and support high levels of merit for the top performers.

Since we made it a practice and policy to identify at least two examples of each employee's best work each month, there was little argument from the adequate performer whose recognized and reported best work was consistently adequate.

Performance and morale overall is up. Relationships with customers are becoming increasingly more helpful. "It's not my job!" has been replaced with "Let me help you get a work order for this." Some customers feel we should drop everything to serve them—and they're usually right. Employees still think they deserve more compensation, but are continuing to point out areas requiring improvements and some are boldly creating solutions as well.

Summary

Recognize the performance to be repeated. Use recognition and feedback to build performance. Evaluate performance to praise strengths and then give constructive feedback. Provide written recognition of each employee's best work and provide one-on-one performance feedback. These actions, done with integrity, will improve employee attitudes and performance.

Conclusion

We need people to give their best. I believe that well timed and specific recognition of an employee's best work is required to achieve excellence and competitiveness in the long run. If we want it, we have to recognize it.

Endnotes

1. Texas Christian University Handbook for Faculty and University Staff, 1994-1995, Page 1.
2. Contemporary Behavior Therapy, Second Edition, 1993, Michael D. Spiegler and David C. Guevremont, Pages 33-42.
3. There should be equity in compensation and reward systems. It doesn't often exist or exist for very long in a non-profit organization. I had hoped to establish with this paper a means to recognize each individual's best work so that first, the individual knows it was appreciated; second, management would have factual examples by which to evaluate the potential and value of the employee; third, management can compare each individual's value against the compensation rendered for it; and finally, management can use the reward systems to balance inequities. Because of the limits imposed on raises and promotions, we necessarily have to tailor rewards to the individual to adequately recognize, reward, and encourage more of the best performances and continuous improvements. Do not ignore the differences in value provided by workers. Recognize that the worker who produces 50 units of value per hour for eight hours is worth the same as one who can produce 150 units of value per hour if they both produce 400 units of value a day. We want all of our people to have the highest potential and use it every day, all day.
4. "Customer Enthusiasm" is achieved when the customer tells others about the exceptional service provided. This term was adapted from Using Quality Improvement Tools to Build Customer Satisfaction, by J. Stephen Sarazan, 1992, American Management Association.
5. I found that most supervisors complied with the requirement but usually provided just two. I am trying to keep supervisors looking each month for their subordinates' best work, recognize it when they find it, and keep looking for at least one better.
6. The "Brag Book" is a ready collection of documented recognition of employee top performance that I use to brag on group and individual achievements. I update it at least monthly. I am personally motivated by reading how much good we do.
7. The concept for the form and the feedback process were derived from my experience in the U.S. Air Force. The actual items rated are from key result areas of our goals and objectives. This form was created quite easily using Lotus 123, Version 4.0 for Windows.

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The following colleagues were helpful with comments to improve this paper:

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PERFORMANCE FEEDBACK WORKSHEET

I. Personal Information		
Name: _____ Position Title: _____	Primary Duties: _____ _____ _____	
II. Performance Feedback		
A. Work Results:		
- Poor to Praiseworthy +	<u>Supporting Comments:</u>	
Timeliness: _____	_____	
Job/Work Quality: _____	_____	
Productivity/Synergy: _____	_____	
Customer Enthusiasm: _____	_____	
Improvements: _____	_____	
Reliability: _____	_____	
Economy: _____	_____	
Efficiency: _____	_____	
B. Behaviors/Attitudes:		
- Poor to Praiseworthy +	<u>Supporting Comments:</u>	
Concern for Safety: _____	_____	
TQ Leadership: _____	_____	
Sense of Urgency: _____	_____	
Customer Advocacy: _____	_____	
Industriousness: _____	_____	
Skills/Proficiency: _____	_____	
Attention to Details: _____	_____	
Account for Materials: _____	_____	
Safeguard Tools: _____	_____	
Care for Equipment: _____	_____	
Vehicle Operations: _____	_____	
C. Continuous Improvement Efforts:		
- Poor to Praiseworthy +	<u>Supporting Comments:</u>	
Customer Relations: _____	_____	
Coordinate Work: _____	_____	
Problem Solving: _____	_____	
Work Simplification: _____	_____	
Hazard Abatement: _____	_____	
Knowledge/Skills: _____	_____	
D. Personal Qualities:		
- Poor to Praiseworthy +	<u>Supporting Comments:</u>	
Initiative: _____	_____	
Cooperation: _____	_____	
Human Relations: _____	_____	
Respect for Authority: _____	_____	
Loyalty/Dedication: _____	_____	
Dependability: _____	_____	
Dress/Appearance: _____	_____	
Fitness/Strength/Agility: _____	_____	

BEST COPY AVAILABLE

PERFORMANCE FEEDBACK WORKSHEET

(Reverse Side)

III. Strengths, Suggested Goals and Additional Comments

[illegible]

IV. Ratee Comments

[illegible]

Rater's Signature _____

Date _____

Director's Signature

Date _____

Creating A Cross-Functional Workforce

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Introduction

We are giving this presentation to share with you the rotation program we have implemented in the Support Services business units at the University of Texas-Houston Health Science Center. Our rotation program along with other professional development activities are mounting into the creation of a cross-functional workforce. This presentation is a plea, a challenge, and if necessary, a admonition for you to become a leader, within your organization in the effort to lay the foundation for a cross-functional workforce.

Your future, our futures, can no longer proceed by viewing employees as a pair of hands" or individuals who come to work to perform the tasks they were hired, transferred, or promoted into. None of our futures can continue to exist in valuing wrench work over knowledge. There is a need to create for every employee the freedom to think and the freedom to act. Our futures must lie in employees that have individually unique experiences, diverse interests, involvement in university activities, teams and committees. Further they must possess the flexibility and open mindedness to try something different from the way they have always done it.

Too many of our jobs have become too specialized. We have come to be dominated by experts; a good working definition for our purposes is: **"A expert is a person who knows more and more about less and less"**. Take a moment to think of an employee or employees within your organization, who are considered to be an expert; are they totally proficient in just one area of your operation? Is this the person that everyone goes to for resolution of any situation in their one specific area of expertise?

In the current business climate of American industry and higher education administration, the "expert employee" is but a short step from becoming a dinosaur. If this employee does not gain an understanding or interest in other areas in your operation, they could be one re-engineering team, one task force recommendation, or one new development in technology away from be-

coming extinct. This would be a pitiful waste of an individual who gained their position because they were an expert in a specific, narrow and rapidly obsolete field.

Support Services, encompassing the disciplines of procurement, distribution, buildings stewards, and tenant services, implemented a job rotation program in July 1992. The program is designed to expose our employees to processes in business units other than their own. The objective is for the rotator to acquire an understanding of another unit's processes, operations, issues, philosophies, and to gain respect and an appreciation for the work of other individuals within the university community. Through the rotation program the beginnings of a sense of community is being built. Expressed simply, we wanted to operationalize the Native American adage of not criticizing another until we had walked a mile in their moccasins!

From the onset of the rotation program until January 1993, one manager per month would rotate to another area. In January 1993 the program expanded to include all staff, and the number of employees on rotation per month was dramatically increased. All Support Services employees participate in the program — exempt, non-exempt, supervisory, non-supervisory, administrative support, technicians, craftspeople, maintenance people, the degreed and the non-degreed — everyone.

Who Are We?

At the University of Texas-Houston Health Science Center, the Support Services organization consists of facilities and procurement business functions and related administrative activities.

Since October 1994 we have been in a non-traditional organizational structure. In the summer of 1993 all departments in the Administration and Finance portion of the university were charged with developing a four-level organization to be implemented on the 1st of September, 1995. Four-levels meaning that from the Executive Vice President of Administration and Finance to the level of employee who directly services the customer, there are only four levels of hierarchy. This change was made ultimately, so we can provide better service to our customers and our stakeholders by eliminating hand-offs and communication snafus.

Support Services' version of a four-level organization is not just the traditional structure with some layers of management cut out. We reinvented an organization that rocks our very core. We are organized by process, not by traditional function. Everyone in Support Services understands we are working toward a boundryless organization. There were nine departments and now there is one. We are challenging, and are still changing, continually asking **why do we do what we do**? We are breaking all molds of what has been the status quo, in order to bring better, faster, flexible, and focused customer oriented services to the university. In a truly boundryless organization an employee is equipped to add value to several business processes.

The four levels are: counselors; partners; coordinators; and associates. Counselors envision, elaborate and set the strategic direction of the organization. They are responsible for senior level policy advisement, mentoring, and knowledge sharing. Partners are the leaders of the individual and discrete business units. They are responsible for successful customer interactions and revenue and expense. They function with other related partners as a board of directors in policy formation, salary administration, and business viability. Coordinators are the owners of the processes within the business units. This is where the rubber meets the road. The expectation is that processes will be simple, fast, flexible, and that coordinators will be the individuals who practice continuous quality improvement at the highest level to ensure that our customers will want to

choose us instead of any other provider. Associates are the individuals and the teams who represent the most crucial and fundamental service delivery point in the organization. These are the people that do the work, that are closest to the customer, and who will determine whether or not this endeavor is successful.

We are an organization rich in diversity and varied life experiences. Our organization is 25% female, 42% minority, and 53% of our employees have worked at the university for more than five years. Our partner of Tenant Services is a licensed pharmacist, our small order coordinator began working at the university 15 years ago as a courier for Mail Services, and an associate on our buying team holds a degree in German and moonlights training second-year medical students at Baylor College of Medicine on how to give gynecological exams. The backgrounds of these three individuals illustrate the abundant variety of life experiences within our organization.

Rotation Structure

A rotation lasts three weeks. The rotation is not a vacation away from responsibilities, it is a learning experience. The host" business unit drafts a rotation plan with learning objects and goals. The expectations are reviewed with the rotator on or before the first day of the rotation. A negotiation occurs and a commitment between the rotator and the host" department is made. At the end of the rotation the rotator makes an oral presentation to the host" business unit describing their rotation experience and the rotator prepares a written report which is shared with the host" business unit and their home unit. From the inception of the program in July 1992 through April 1995, 203 rotation experiences have occurred.

Each employee was surveyed to identify which business units they have the strongest preference for. Our objective is that every employee will rotate to all Support Services business units over a five-year period. The rotation schedule is made for three to six months at once in a process we call Rotation Bingo.

In Rotation Bingo, employee preferences are considered in arriving at the final rotation schedule. The coordinators from the business units barter their people and positions to make the plan work. The business units evaluate who will be gone from home, when, and what activities will be occurring. The coordinators arrive at a match of which employees will be scheduled for rotation. We publish the schedule that results and distribute it to every Support Services employee.

Since we first began the program, the rotations have been within Support Services. A few employees have rotated to departments within the university outside of Support Services. We plan to expand the program to have a rotation or an exchange with other institutions. This will allow us to see different approaches to like processes and also allow us to build greater relationships with others in higher education administration.

Program Benefits

The objective viewpoint the rotator brings into the experience helps the host business unit evaluate their own experiences and work routines. Process improvements emerge for the host and home department.

One process improvement that comes to mind is in a maintenance and repair area whose parts inventory had been in a state of bedlam. From 1989 through 1992 it was a goal in the operating plan of that building group to organize their inventory and computerize the inventory. Year after year no movement was made toward reaching the goal. In 1993 the primary administrative support person for the building group went on a rotation to the Stores area. First hand she saw the application of the ABC methodology of categorizing inventory, how bins could be used to organize an inventory, numbers assigned to parts, and scanned using bar code technology.

In rotation she saw how to perform a physical inventory and realized its benefit to her building group. What resulted was her personal commitment to organize the parts inventory for the building group. Upon her return from rotation she began applying what she learned about the organization of inventories while on rotation. Today the parts inventory in the building group is very organized, automated and bar-coded. Each type of part is in a bin with its own bar code label. When a part is used for a project, the label is scanned. The inventory is incorporated into the work order system so when the total amount of the project is calculated labor costs and parts cost are included.

Some process improvements have emerged by a rotator asking the simple question "Why do you do that this way? When a accountant from the Office of the Assistant Vice President went on rotation in our construction business, he asked a simple question that resulted in a process improvement. The craftspeople did not have a fax machine. The craftspeople assist with estimating, they receive some pricing, they communicate with customers, but had no fax machine. The craftspeople had to walk from the crafts shop to another building to send or receive a fax. The rotator thought it did not make sense for every department in the university to have a fax machine except the craftspeople. A simple suggestion, coming from a different perspective, increased productivity, customer responsiveness and helped our craftspeople feel like equal members of the university community. The rotator was right!

Depth Of Commitment

When we started the program, and even today, a few individuals do try to find an excuse why they cannot go on rotation. Simply, we as the Support Services organization have decided that we value the professional growth of our people and we stay committed to the program.

Support Services' employees have ten principles that they drafted, discussed, debated, and approved in 1993. These principles are the foundation of our business interactions. Our Continuing Education principle states "On-going education is a process that supports our ability to perform and contribute." Living by our principles, the rotation program has a higher purpose than to be corrupted by the few who are not open to new experiences.

The rotation program is just one aspect of our commitment to the professional development of the Support Services workforce. We have had an objective for the last five fiscal years of providing 180 hours of professional development to every Support Services employee. We have encouraged an environment of learning. Enrollment in seminars is not limited to the subject matter the person is working in at the present time.

We encourage the few individuals who do not have high school diplomas to get their GED's. We support employees who abandoned their college studies years ago to re-enroll and obtain their degree. Individuals who aspire to obtain a certification in their discipline are sup-

ported in their efforts. Our support in these efforts is tuition reimbursement, flexibility in work schedules, and moral support.

One of our objectives is to train each Support Services employee in the Stephen Covey methodology of the Seven Habits of Highly Effective People". This effort began in 1992 and by August 31st of this year, our objective will have been accomplished. Our employees also participate in Continuous Quality Improvement training. These two initiatives provide everyone with the same fundamentals for human interaction and for analyzing processes.

We have challenged our employees to broaden themselves by volunteering on university committees and in university community outreach. These opportunities provide an employee the opportunity to build relationships with others outside of their business unit and to learn new skills. An example of this is our participation in the Junior Achievement program. We have provided time during the day for our employees to go to elementary schools around the city and teach business management skills to elementary school children. This increases an employee's confidence in public speaking, helps the local schools and provides a truly rewarding volunteering opportunity.

Conclusion

What will allow facilities professionals in higher education to prevail in the changing workplace is not wrench work; we are proficient in our mechanical and technical know-how. What will allow us to prevail are soft skills - the freedom to think and act; the ability to be prepared to seize new opportunities; and the ability to appreciate all disciplines within the university community. We will prevail by being a cross-functional workforce which treats each individual with respect and dignity and acknowledges that sharing is not a weakness.

In This Era Of Shrinking Budgets, Is Organizational Redesign And Adopting A 'Quality Culture' Worth The Pain?

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Associate Vice President, Facilities, Planning And Management

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Introduction (Robert S. Hascall)

Two thirds of America's top corporations are said to be re-engineering one or more of their major business units today. Innumerable companies are adopting Total Quality Management or undergoing similar organizational and cultural revolutions to improve the quality of customer service and improve quality of their employees' working lives. Why? Because competition is so fierce in so many business fields that companies simply have to find ways to satisfy their customers better, yet produce their goods and services with fewer people and resources than ever before. And you can't improve customer satisfaction for long with disgruntled workers. So, improved customer service and happy employees must go hand in hand. That's reality. It's global. And it's here today.

The same reality applies to us in higher education. We're also hotly competitive with one another; we also need to satisfy our customers better. Just listen to these phrases from a recent article about why the college ranking guides published by *U.S. News*, *Money* and other magazines are so popular with students and parents — but unpopular with universities: "comparison shopping," "consumer demand for quality education," "being judged by outsiders," "competition for good students," "cost-conscious administrators," and "It's a buyers' market." For students and

their parents, a college education is now the second costliest investment in their lifetimes! So, we have to compete hard to win their business.

Yet higher education is suffering a revenue crisis. We've not only got fewer students than we may want, but we can't raise tuition and fees high enough to cover our fast-rising operating costs. Government and private financial support and research spending is dwindling. The bottom line is that our budgets are often shrinking in real terms, not growing. So, we need to motivate ourselves and our employees to do things better and to do more things, but with fewer dollars. My university may authorize 3% salary increases for our people next year, but they won't give me the money; they'll say, "You come up with it." But, meanwhile, we're also expected to spend money to improve service to our customers.

Overall Organizational Approach

That's why we are trying to re-design USC's 600-member Facilities Planning & Management organization to include dozens of self-managed teams, and simultaneously to adopt quality as a key part of our department's culture.

At USC, the Facilities Planning & Management department is responsible for three major areas: First, we oversee the planning, design and construction of all USC capital projects — from new buildings to new flower beds — and make sure they conform to the university's master plan. Second, we're responsible for operating, maintaining and improving campus facilities — from cleaning classrooms and running the heating and air conditioning systems to doing routine painting and plumbing. And third, we install, operate, repair and maintain all of the telephones, data telecommunications and alarm systems on campus. In effect, Facilities Planning & Management is a combination of three units with roughly similar, but by no means the same, missions or requirements for manpower or budgets.

For example, our Planning, Design and Construction unit requires a small staff of 20 professional engineers, architects and draftsmen to coordinate the work of many architects and contractors. The Operations and Maintenance unit has a very large staff of 450 landscapers, building custodians, electricians and other skilled trades. Our Telecommunications unit's expertise is largely in the hands of 40 technicians and service representatives who put technology directly to work for our customers. And, with 45,000 students, faculty, administrators and staff on campus every day, we have a lot of customers to satisfy. Like so many campuses, in fact, USC is virtually a city unto itself. Collectively, Facilities, Planning & Management is one of the most culturally diverse departments at the university. And among our 600 employees, we have 120 different types of administrative jobs, skilled trades, professionals and other job classifications.

Learning to operate each of our major business units more effectively — as well as the human resources and financial staffs that support them — is the best way to survive the budget pressures. And making the concept of quality come alive throughout the whole organization is the best way to improve customer satisfaction. This is not another program that's being brought in and tried and then measured to see how successful it's going to be. It's something that really is becoming part of our culture and will keep on being part of our way of doing business.

And we can't stop serving customers while we reorganize ourselves, either. So, changing ourselves successfully is requiring a multi-faceted approach. It doesn't work just to say, "Top management wants us to do this." So, we go out and do it, but we don't present it to the employees in a way that says that it's important to our mutual success — and why — and that we're go-

ing to help them and show them how to do it. We've had to adopt a different approach to managing our people, empowering employees and involving them — and our customers — in improving customer service. Meanwhile, we're also taking out layers of management and creating opportunities for employees to advance themselves.

Developing Our People

I began the effort shortly after joining USC over five years ago. It's my preferred approach to manage organizations in a way in which employees participate in management. When I was working my way up through various retail positions as a young worker in the grocery business, I'd imagine myself being a leader. I would plan to avoid the mistakes of my own managers, some of whom didn't have a clue about how to do things effectively, but still would pass down orders to do things in ways we employees knew wouldn't work. Of course, none of us had the courage to say so. We'd go off and try it, but, pretty soon, we wouldn't have to do it anymore because it was obvious it didn't work. I thought to myself, "If I ever get to be in a position where I'm leading an organization, I'd give my employees a say in decisions we make and ask their opinion before implementing things." So, this is really my personal style.

In Human Resources, we're getting employee teams deeply involved in hiring new employees. We started a couple of years ago in our Building Services unit when a group of employees developed a profile of the ideal employee that they'd like brought in. The idea was to recruit employees better attuned to our quality efforts. Now, in several forms, with Human Resources leading the way, it's standard procedure to use selection committees of 4-6 employee peers, plus customers and a supervisor, to develop a profile of what their expectations are for a position and then recruit, interview and hire someone who meets their profile.

For example, our custodian committee came up with this profile for an ideal employee: a successful work history; dependability; honesty; a team spirit; experience in customer service; and safety consciousness. Those are among 10 primary characteristics we seek when interviewing and hiring people. In other words, they're our benchmarks, and we try not to compromise on them. Among the five secondary characteristics in our ideal profile are things like: directly relevant current job experience; and, given our melting-pot culture in LA, bi-lingual skills and an ability to read and write English.

Bringing in better quality people is one of the keys to the present and future success of our organization. Nearly one fifth of our employees have been hired this way over the past two years. Nobody else on our campus is doing this; we're on the cutting edge. And the effect is dramatic. From 1982-92, a period of 10 years, there was only one opportunity for a promotion out of USC's custodial ranks. From 1992 till the present, there have been 32 promotion opportunities for custodians to team leader, supervisor, and to our Special Task & Repair Team — our STAR team, a group of custodians skilled enough to provide routine maintenance services like painting hallways, patching holes in walls, unplugging plumbing fixtures, etc. Most of these positions have been filled from within, and our policy of internal promotions has been widely applauded and accepted by employees. We've even instituted an apprenticeship program to move people from their starting positions onto the Star Team and eventually into our skilled trade shops.

Also, the entire hiring and promotion process is fairer because the same questions are being asked of every candidate. Now, there's good documentation of each hiring. People feel they get a fair shot at openings, and they do. We used to have challenges occasionally, but no more. How-

ever, it takes more time to get the process completed and you need someone to facilitate it. So, we're now creating an eligibility list of qualified candidates to call upon when we have an opening.

We're also learning to understand more about the kind of training our people want and need. Since we're a university, you'd think that would be obvious, but it isn't. There's a need for ongoing training in customer service, and we've had several successful sessions so far. People also need core training in the professions — for example, teaching about electrical codes within our skilled trades shops. However, we haven't yet marketed this idea well enough within the shops to be able to design programs that will help them. Given today's very diverse work force, especially in Southern California, you may not be surprised to learn that some of our most popular training courses are in basic arithmetic, reading and English language skills. Thirty of our employees just took and passed our E-S-L (English-as-a-Second-Language) training program during work hours. We also are training our people in how to apply for jobs and how to interview — so they'll be able to take advantage of our "hire from within" policy and so we'll get the full benefit of their skills.

Right now, I'm working to convince our leadership staff that they also need to foster, organize and promote specific training programs supporting Equal Employment Opportunity, welcoming cultural diversity, and stamping out sex harassment and other forms of discrimination at every level.

By the way, because we must constantly improve service delivery to campus customers, we don't make promises to our people that there won't be more downsizing. If meeting customer expectations requires contracting out for some work, so be it. Right now, our carpenters and painters are on notice — deliver better productivity or we'll outsource those tasks. We are also looking at other opportunities to improve services and reduce costs by contracting out custodial services, roofing and elevator maintenance.

Redesigning Facilities Planning & Management

As the head of a large organization, how do you sponsor change on a major scale and make it take hold over a long period of time? Well, naturally, you start off on the wrong foot, right? When I arrived, a consultant was already on board helping launch numerous teams within our organization. But they were basically all task-oriented, dealing simply with issues identified in customer surveys, but not with the larger social issues — employee trust and concerns about their management, etc. — nor cross-boundary problems. Cross-boundary is where our customers saw a lot of problems — blips in the work flow, which was elongated and ineffective. But the employee teams didn't confront those. Also, the teams were being managed by the consultant, rather than managing themselves. Unfortunately, the whole effort died and it left a bad taste in people's mouths because of mis-management by ourselves.

But, I'm convinced teams are important. With the budget and schedule pressures we all confront, in the face of rising customer expectations coupled with resource limitations, technology advances and the need for greater productivity, only well-managed teams are smart enough, agile enough and lean enough to get the job done. And I think the way to form the most effective teams is to be able to know and trust your fellow team members well enough to be confident that their needs are being met as well as your own — making teamwork a win-win situation rather than win-lose.

Today, we on the leadership staff have been initiating our own team-building effort before insisting that team-based management replace the hierarchical approach throughout the rest of the organization. In other words, I and my direct reports are "walking the talk." Here are a few of the things we've done and are doing:

- First, our commitment to change is driven by a 1-page Mission Statement addressed to the university community, our daily customers and our employees. We're shifting away from being just a convenient "tool" on campus to aligning our services with USC's goals as a university and matching our ability to meet customer expectations. And to do this while building a healthier workforce. We know this process will take years, so our commitment is long term. We started by surveying all our customers about what they thought about our service and what their expectations are, as well as surveying employees in each unit about their work environment and leadership.
- Our vision of the key results we should strive for in the immediate future — and the steps we need to take to get there — is spelled out in a five page strategic quality plan.
- At the management level, our team-building efforts include annual 2-3-day offsites to address organizational issues; a half-day forum once every quarter for team leaders, managers and supervisors to discuss ongoing changes; and occasional half-day social outing for my immediate reports and I to get together as a group but away from the campus to enjoy each others company and talk without an agenda. At our weekly staff meetings, we try to limit the formal agenda to three items, one or two of them task oriented and the third involving a round-table discussion.
- Also, each one of us has undergone some testing by an industrial psychologist to get a better idea of our individual working styles and behavior — what motivates us; how much flexibility or structure we need; how well we deal with authority — both as managers of other people as well as in response to our own bosses and superiors. And, even more important, to get an idea of the behavior we use when interacting with others, especially under stress. Has this touchy-feely stuff paid off? You bet. As with any service group within a much larger organization like USC, we're always being confronted by stress: the stress of budget crunches, stress from personality conflicts, from community issues and changes in our operating environment, from seasonal changes like graduation or when the students return each fall, and certainly from natural disasters like the Northridge earthquake. Stresses come in many forms and from many directions at once. The key to handling them is being able to draw on the strengths we enjoy as individuals while avoiding our personal weaknesses.
- I think one good example of how it's helped will suffice: As a result of learning about our individual working styles and how we react under stress — and sharing that information — we as a team were able to confront two of our members about a nasty and growing interpersonal conflict — replete with professional and cultural issues — and to force them to use professional counseling to resolve it. That has been a success and has saved our organization from having to get rid of one or both of them to end it. It is certainly painful dealing with such conflicts, talking about it and about your feelings when confronting issues you would rather ignore, but it really leads to lasting improvements. And I'm convinced that it is essential to the success of any team building effort.

So, in keeping with recognition of our customers needs, the different makeup of our individual business units and their managers' leadership and styles, each of the three major units within our department — Telecommunications Services, Facilities Operations & Maintenance, and Planning, Design & Construction — is being allowed to proceed with organizational redesign at a pace appropriate to its own staff's size, workload and training level.

Presentation By Alvin W. Hopkins

You remember the question posed by Bob in the title of our presentation? "In this era of shrinking budgets, is organizational redesign and adopting a 'quality culture' worth the pain?" Well, I think I can answer it. My answer is an unequivocal, "I don't know"

Because I don't really know yet whether it's been worth the pain. I'm optimistic, but also a bit skeptical. For, what we've been striving for with my small group of about 40 telecommunications staffers is really a revolution in the way they think about themselves as individuals. And a revolution in the way they think about each other. Not to mention the reorganization of our daily workflow and how we interact together as a team.

Background

Our transformation began three years ago. It's still going on today, and I think it will still be going on as long as USC needs a separate group of people to service campus telephones and computer linkups and provide a growing number of other telecommunications services — in other words, for the foreseeable future. Three years ago, however, the immediate outlook was grim. Our employees felt their needs were ignored and our customers were convinced that they were getting lousy service.

An employee survey showed five problem areas: poor supervisor credibility; poor communications up and down the organization chart; unclear goals and roles; lack of organization of the work and poor work flow; and poor relations and nonexistent coordination with other service groups within Bob's department, like Operations & Maintenance and the campus architect.

Analysis

With the help of an energetic outside consultant, we formed our first team, eight volunteers—all non-managers. Their main tasks were to look at the telecommunications unit objectively and describe what it is that we actually do for customers. What's our purpose, our objectives and the environment in which we operate? And they acted as a sponge for all the problems people perceived about us. More than 90 problems were listed; some of these will be used as benchmarks against which to measure our progress. One of the most important things we learned about ourselves was that we are in business for just three key reasons: to install and maintain phones; to acquire phone equipment for our customers from various vendors; and to make sure everyone always hears a dial tone when they pick up a campus phone. To our customers, if they don't hear a dial tone, we're responsible.

But, painfully, our analysis team learned that, as a unit, we had no real objectives. We didn't hold ourselves accountable for much of anything, and therefore we didn't try to measure success

in any way. Not by our performance-to-budget, or cycle time, or turnover. They also discovered a tremendous number of "variances" — in other words, outright errors, or problems in service delivery — many of them affecting the quality of our work and its cost. Most of the variances were being shoved off on the lowest paid staff members to solve or fix.

Clearly, it was time for us to re-think our organization in a major way.

Design

So, our next step was to evolve the "analysis team" into a "design team." Its job? Brainstorm solid ideas to eliminate the variances and improve the quality of our working life. One of the most notable design team recommendations was conversion of the telecommunications unit from the traditional hierarchical org chart to completely self-managed teams. Because of our relatively small size and the fairly well defined boundaries of our work, we have been able to do this.

Envision a pie shape with five slices. One large slice is our "service delivery" team — which is about half of our total staff. It is further divided into three teams which serve three distinct campus zones. Each zone team expands or contracts as needed, depending on workloads, vacations, etc. Most of our former supervisors ended up as part of another big slice, the "technical support" group. They help train service delivery team members and act as advisors and technical experts. Some former managers and key professionals make up a third slice, the "strategic planning" team. They evaluate new products and services, do long-range planning, and act as liaison to senior management in the university. The next slice is our "project management" team, which handles capital projects, new construction installations or remodels, and engineering/estimating. Then there's a slice for our "administrative support" team, which handles purchasing, office management and payroll in addition to secretarial and clerical tasks. And, finally, our "switchboard operators."

Although everyone has retained their old titles — just so the university pay system doesn't get confused — I'm the only actual "manager" left. And, as you can imagine with all those self-managed teams working hard to actually be self-managing — and sometimes succeeding — my day-to-day role has changed dramatically. I've got to be a lot more observant, a lot more restrained, and avoid telling people what they ought to do. Yet, I've also got to be a lot more vigilant in making sure they become effective in doing what they ought to do.

At the center of the pie, where all the slices meet, envision a small circle; that's our Inter-team Forum. In effect, it's a coordinating team composed of representatives of each of the six operational teams. But it's an inter-team group, not an "inner circle" in the political sense. For the time being, it monitors activities among the other teams and addresses problems and implementation issues as people get acclimated to the new organization. The Inter-team Forum, for instance, is tackling the budget process for the whole telecommunications unit. And it makes decisions about travel, hiring and training.

Implementation

All of this sounds great on paper but, I must tell you, theory and practice are still far apart. A lot of people simply have a hard time managing themselves. Either they really have to struggle to break the old patterns, or they are afraid of taking responsibility, or just plain avoid it. There's

no definitive "proof" that the new ways have taken hold and people won't backslide when they hit a snag. It's encouraging, however, that during a feedback session at least one employee expressed an idea that a lot of them are thinking. "I could never go back to the old hierarchical way," she said. "I could never go back to just working for a supervisor again."

The toughest issues are always the social ones: getting people to communicate instead of competing or, worse, ignoring each other. Upgrading the job skills of young staffers, instilling a better work ethic, and teaching them patience. Convincing long-term employees to be less concerned about job titles, who has got which office, and similar "status" issues. By and large, though, older employees seem to be more in favor of the kinds of changes we're making because it frees them to use a variety of skills gathered over a lifetime. They're also more flexible and more willing to question things than their younger compatriots.

The first really good test of the fully self-managed concept is still underway. Our "pay task force," which is charged with determining how team members will pay themselves and defining the process by which salary dollars will be divvied up, only was formed this past February. It has spent the last six months reviewing the possible pay systems and designing a process that both rewards team performance and encourages individual learning and risk-taking. Implementation of this new system is just beginning, however, we believe we will achieve the expected results.

Results to Date

We have no way to accurately measure our teams' progress. Unfortunately, there's no reliable benchmark of performance under the old organizational scheme to compare ourselves to. And we haven't set up any detailed metrics yet. But, there is at least some favorable anecdotal evidence that we're doing a better job. Many of our employees say they feel better about themselves, and they act like it. And informal conversations with some key customers reveal that they believe we're doing a better job of meeting their needs and our cycle time is shorter.

Today, we're charged with a lot more tasks than we were half a dozen years ago, but now we're performing them with about half the people. We're providing more complex telecommunications services and meeting more complex requirements. And we're handling a far higher volume of requests for service because of all the tremendous growth in telecommunications on campus. Yet, I hear fewer loud complaints from customers than just three years ago.

So, I'm optimistic that organizational redesign and adopting a quality culture are worth the pain. But self-managed teams aren't a panacea. We managers still need to manage the process, to cheerlead at times, to lead by personal example, to give our people room to fail, but to make sure they get the training and tools they need to succeed.

Presentation By Maurice Hollman

Like Alvin's group in Telecommunications, we're finding in Operations and Maintenance that a team-based approach works better than the old hierarchical approach. We've found that our employees respond enthusiastically to opportunities to participate in decisions. I tell them to "Think of your unit as a business, and become more actively involved in running 'your' business."

A team-based approach to work is making us more effective in our 45-person grounds keeping unit. And it's motivating our 120 people in the eight skilled trades shops to participate willingly in committees devoted to change.

But, we're yet to create any self-managed teams in most of our Operations & Maintenance units, and I'm not sure we ever will. Why? I'm not sure I know the answer to that — perhaps it's because of my personal leadership philosophy and attitudes regarding quality and change management; perhaps it's because of past experiences of certain of our units with poor supervisors; or maybe just because of the sheer numbers of people to coordinate across disparate units. But I really think the reason is my belief that we have to understand the existing organization and its history, and then make sure any change process or quality process is tailored to our people and their needs.

For example, the 165 folks who work in building services as custodians have resisted a team-based approach and the idea of shared responsibility. They actually want the old hierarchical structure continued. Even with the threat of competition and full knowledge of our need to change, they still resist. Maybe the building custodians are tough to change because they usually work at night, without any students, faculty or visitors around. Or, maybe this unit's people have had just too many years of top-down management — being told what to do and when to do it. Whatever the cause, we're finding it very difficult to re-educate these employees toward a team-based philosophy. On the other hand, perhaps our 45 grounds keepers are more open to change because they're outdoors in the daytime, interacting with people around campus, getting instant feedback on their landscaping work. I don't know.

Change Is Inevitable

But, make no mistake. We are changing: changing to meet customer expectations, changing to meet the university's fiscal goals, and changing to provide our employees the training and career path opportunities they want.

Like every other university Operations & Maintenance department across the country, we have woken up to the reality of constant budget pressures. The reality of being given responsibility for new buildings as they come on line as well as all the aging ones that are having their useful lives extended — without increases in operating budgets. The reality of a backlog of deferred maintenance that averages about a million dollars a building and is growing, not shrinking. And the reality of new laws and regulations that boost the cost of maintenance, like handicapped accessibility, environmental cleanup and recycling.

We're especially aware of the new reality of rising customer service expectations. Unfortunately, however, a lot of Operations & Maintenance people have had a hard time understanding that we even have customers. We've been giving ours intensive customer service training. For example, teaching them how to approach customers and talk with them; how to be responsive and show empathy for customer problems; and how to take direct responsibility for solving those problems.

We really have to work at becoming customer-oriented. And we have to work at delivering a high-quality, cost effective service that is competitive with the outside market. Why competitive? Because we're surrounded by competitors. LA's downtown skyscrapers, just a few blocks away, are served by hundreds of maintenance service companies. And we're smack dab in an urban labor pool of millions of people.

So, we're having to examine every aspect of our department to make sure we're structured for success.

Operation & Maintenance's Organizational Redesign

Two years ago, Operations & Maintenance began an organizational redesign led by the same consultant that Alvin has used. After 18 months, however, we decided to redirect the funds being spent on the consultant to other pressing needs. But, we really were committed to the change process and determined to continue. We changed our approach and created a half-dozen employee design teams to speed up the pace of change in specific areas where we needed improvement right now.

Let me give you three quick examples:

- One real barrier to our tradesmen doing their jobs was running out of parts and materials. Our stockroom re-design included appointing a new supervisor, buying bulk supplies from a less-expensive source than we had been using, and investing \$60,000 to expand our stockroom facility to hold bulk inventory.
- We also began investing to replace our fleet vehicles. Our design team made it clear just how critical having reliable vehicles is to our employees' ability to get to all their work sites around campus with the materials and equipment they need to do their jobs. A long-term fleet replacement program was long overdue. Doing this has been a great morale booster, and the same thing will be done again this year. We also intend to upgrade our 2-way radio system. Reliable communications with employees in the field are essential to accelerating our response times to customers and to improving the effectiveness of our operations.
- A third immediate improvement resulted when our construction estimating group was re-organized and the director's position eliminated to terminate what had become an "empire" mentality.

We've also developed what we call the "Star Team." The Star Team is a group of workers with basic trade skills. They are not journeymen, but they are capable of doing a wide variety of building maintenance work. In addition, our Star Team members have taken on responsibility for routine non-technical preventative maintenance — such as changing belts, hoses and filters and lubricating machinery.

The Star Team does the minor stuff that the trade shops cannot seem to get to, but which drives customers crazy. They self-direct their own workloads. They have direct contact with customers. They operate in a "See it, fix it" problem-solving mode. We hire Star Team members from our custodial and grounds units, so it provides an opportunity for advancement. And we've created an apprenticeship program based on starting on the Star Team and receiving the coursework and training needed to eventually qualify to become a journeymen in one of the eight trades.

These types of employee team-based redesign approaches — although they're directed by a management team rather than totally self-managed — seem to be working for us in Operations and Maintenance at USC.

As you are hearing, each of us in Facilities Planning & Management is taking a slightly different approach, but I believe we're all staying true to Bob's management philosophy and vision for creating a department that's really focused on quality service and employee empowerment.

Closing Remarks By Robert S. Hascall

Keeping a Lookout for SCUD Missiles

In closing, I must tell you that resistance to organizational redesign and to adopting quality as part of our culture — resistance from peers, supervisors, subordinates, middle managers and frontline employees — that's also reality. It has to be recognized and dealt with effectively. Reactions to change typically include denial of the need to change and rationalizing of the status quo, as well as sadness at losing past allegiances. As you've heard, some workers try to ignore change and act as if it isn't happening; others become passive saboteurs or even active ones, and a few are so upset they become ill and even try to go out on disability.

Finally, I must admit, to make the team-building process and adoption of quality a success in an academic environment that doesn't automatically endorse concepts imported from the business world is requiring patience and astuteness at even much higher levels.

From Keeper To Partner: Creating A Future Through Organization Culture Change

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This report tells the story of momentous changes that have taken place within the University of California, Davis Physical Plant. The authors wish to acknowledge the effort of those individuals who shared a common goal to seek new strategic dimensions.

From Keeper to Partner: Creating A Future Through Organization Culture Change

1. Brief Abstract

Achieving success in today's financially stressed academic environment requires facility departments to adopt competitive industry management techniques and technology. UC Davis' Physical Plant is restructuring its traditional maintenance organization into an enterprise oriented, customer driven facilities management team. We are mirroring industry's focus on service and productivity. Acknowledging the need for change, we have nurtured an atmosphere of transition in organization culture. But how do managers initiate fundamental, almost personal change within a complex and tradition-bound organization? This report outlines the UC Davis experience with answering this question through productive ideas generated from internal organizational units.

Campus expectations for expanded and less expensive services demanded a heavy investment of our attention to restructuring plant operations and the organization of our resources. The strategic significance of this extraordinary effort was underscored by the synchronous conflicting influences of severe state budget reductions during a period of change spanning several years while our client departments demanded early and tangible results. Campus demands were not always sensitive to our professional needs to deal with changing environmental regulations, the growing technological complexity of asset management, a growing backlog of unfunded deferred maintenance, and a substantial growth in academic programs.

Managing change was exhausting and always inconvenient because of deep seated, persistent resistance to change by a vocal, strategically positioned core of staff whose working alliances were entrenched in tradition. This well intentioned core had long been the pride of Physical Plant, providing high quality maintenance which supported the richness of campus academic programs. To the academic community, which little understood the complexity of institutional infrastructure, these tradition-bound Physical Plant programs appeared fragmented, occasionally complacent, and sometimes arrogant. Caught in the fray and unable to see possibilities for change, some Physical Plant staff became disillusioned with not being allowed to contribute to decision-making. And at a most threatening time, we experienced a loss of institutional knowledge from budget driven early retirements.

Like it or not, behavioral and intellectual challenges were shaping the foundation of our organization which stood within an increasingly complex social institution. In short, we faced a culture shock and the need for a striking change in our organization culture. Change was not optional; it was inevitable and imminent. Our professional standing was challenged by a stressful institutional environment where faculty and staff were made to compete for program survival. Because instruction and research are primal reasons for funding it was not surprising that facility maintenance and operation would temporarily drop in institutional priority.

Our reorganization of strategic business units is now complete while culture change continues as an ongoing effort. This report is an accounting of how we made the transition to new strategic directions and how the bubble of "business as usual" was actually broken. It describes the process of managing difficult interpersonal changes, the prospects for keeping the process going, and finally how our operation was strengthened with renewed vigor and energy.

2. This description is a detailed elaboration of the initiative not exceeding four pages.

"We have two choices: Either Physical Plant changes to become an enterprising, customer driven organization responsive to the needs of this Campus, or we cease to exist."

"The changes that are going to be required of us will affect everyone in Physical Plant. Get it very clear in our minds! No one's job will be the same after reorganization."

"The changes that are going to occur will not be dictated from above. We will engage in a process that draws out of the very bowels of this organization the ideas, the problems and the solutions that will be everyone's responsibility to implement. These changes will originate from our grassroots. It's the only way it will work. There must be a high level of buy-in from all units to the need for change before we can launch and realize real change."

"Given the opportunity to be creative, staff will surprise us every time."

These challenges by our Associate Vice Chancellor—Facilities, while poised on the precipice of making the commitment to an enormous undertaking, were introduced in the early stages of re-engineering our operations in 1991. These statements to our staff publicly set the stage for managing the internal change process on which this report will focus. In line with this focus and useful to this discussion in Michael Hammer's definition of reengineering:

"Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed." (Hammer, 1993)

Background

UC Davis' 500 Physical Plant employees operate, renovate and maintain 9 million gross square feet of buildings on 5500 acres. Physical Plant operates a waste water treatment plant, landfill, co-generation and central heating plant, campus fire department, high voltage distribution system, and domestic and utility water systems. The asset value of the plant maintained by Physical Plant exceeds \$1 billion. Our annual operating budget is \$57 million.

Some 65% of our 24,000 annual work orders and 2000 annual projects are maintenance repairs, emergency responses, or preventive maintenance to electrical, structural, and mechanical systems for the preservation and operation of university facilities. The balance of our work orders are remodels and capital improvements. Construction services include large and small construction projects. Construction and maintenance services are provided through off campus contract services or directly through Physical Plant's own craft shops.

Physical Plant includes full service building trades consisting of skilled carpenters, plumbers, mechanists, electricians, painters, laborers, locksmiths, steam fitters, welders, sheet metal workers, refrigeration mechanics, and controls specialists. We also have a full complement of job planners, estimators, project managers, contract specialists, materiel buyers, and production support personnel. Physical Plant also manages custodial services, solid waste management, and campus grounds maintenance.

This paper highlights the combination of forces—some planned, some circumstantial—that has resulted in dramatic changes in our business culture. Indeed, these changes are still in progress, and probably will continue for some time. Focused upon in this report are the catalytic occurrences, reorganizing principles, and management techniques that were used to influence much needed improvements in an organization which was becoming less and less responsive to campus needs. We faced the ultimate challenge: seize the opportunity to change dramatically or lose the opportunity to shape our future. Since our staff were best able to see the opportunities, this is the story of an organization that needed to find inspiration and a commitment for change from within. As the saying goes ... We had to pull ourselves up by our own bootstraps!

The pressure to change Physical Plant can be traced to operational strategies that had not basically changed in more than 20 years. The same tools, work flow practices, and delivery systems were in place that were created when the campus was a quarter of its present size. Of course all of these practices were BC (Before Computers). The difference between the technology of the late 60's and the 90's was bearing heavily and exacerbating our "potential for survival." Recognizing the need for durable change that can survive shifting influences and

actually creating the positive energy to bring about durable change are two entirely different issues.

The need for change within Physical Plant was an ongoing campus-wide topic during the 1980's which led the campus administration to reorganize facilities senior managerial assignments in 1989. Physical Plant's internal impediments to change included a lack of consensus on a strategic direction, conflicts between traditional and new values, "scar-tissue" between units typical of organizations under stress, an inability to focus on new issues when old workload burdens were not being addressed, insufficient grasp of industry management practices, and some degree of denial or complacency among staff.

Valuable experience and ideas existed in the organization, but were stifled or checked by tradition. In 1991, the Associate Vice Chancellor—Facilities began to build steam within Physical Plant for change by encouraging the leadership "locked" in the bowels of the organization to the surface. The Associate Vice Chancellor quietly and purposefully adopted the policy of not filling senior management positions when vacancies occurred. Pivotal management roles were offered to volunteers eager to assume temporary "acting management" assignments in exchange for the opportunity to demonstrate their abilities. Although the resulting shortage of managers (some might say "leadership vacuum") temporarily slowed operations, it increased existing pressures on the remaining managers to reassess priorities and program alternatives. Thus began the process of flattening the organization, removing layers of management, and delegating decision making to staff and supervisors closer to our campus clients. Most beneficial, our "acting" managerial assignments recruited bright new stars, new ideas, new energy, and a new willingness to assume risk in the search for new directions. Reaching into the organization for answers created the opportunity for "change from within."

Our strategy for initiating change from within worked very well. With mounting internal pressure for change, compounded by significant State budget cuts and several rounds of staff layoffs, the "pressure cooker" was whistling! Change was demanded from every quarter of Physical Plant. The engine was not only "fired," but it was clearly leaving the station with virtually everyone onboard and holding on for dear life. The destination was unclear, but the fixed rails required a consensus on the choice of departure. The next critical "switch" was to ensure that we were positioned to capture this head of steam in a creative and productive way as new opportunities presented themselves. The positioning techniques developed along the way are the focus of the following "technology transfer" discussion.

Deriving Organizational Focus

The careful seeding of staff expectations and naturally occurring circumstances such as budget retrenchments directed Physical Plant to a point where change was not only possible, but it was imperative. Inter-unit discussion groups began cutting across old, rugged organizational boundaries. Territorial walls came down and inter-unit conflicts were massaged! A much needed healing process grew from staff listening to one another again about organizational and inter-personal disagreements. As we peeled the giant onion, everyone shed some baggage in the healing process. With each layer came new surprises, new faces, new ideas, new layers. In addition to being an organization, we were also a "team." In recognition of our new found solidarity and commitment to positive change, we named ourselves "Team Physical Plant."

In addition to examining the minutia of operational details, staff were encouraged to think abstractly about our future, our opportunities, and about results. Through abstraction, it was possible to desensitize the perceived pain and fear of change. What is change? Staff began to look at change as a process and to become comfortable with managing the process of change. Staff began to think about the process of change more holistically and as a design strategy for achieving end results. It became clear that the process of change needed to become a regular part of our business, not something that begins and ends.

Through a massive, structured process (see Appendix A) involving more than 100 people over six months, Team Physical Plant analyzed, debated and brought into focus the crux of the cultural change in which we were engaged. This multi-level effort focused on team building, developing employee ownership for action, developing employee loyalty to products and campus customers, and foremost on streamlining the delivery of services and the management of resources. These self-directed work groups identified strategic business units centered on grouping resources by technology and by affinity of products. The progression of group processes brought us to a consensus about the basic challenge and process that would feed our culture change:

The Challenge: In light of our functional needs, interdependencies, and purpose, what is the best organizational design that will bring accountability and customer service back into our normal operations?

The Process: We will create change through:

- Creation and use of information
- Redefining who are considered the "experts"
- Changing where and how decisions are made
- Always remaining open to possibility.

To seed our search for change, the senior managers initiated staff discussions of paradigms. These discussions lead to a conscious acknowledgment that we were out of date with modern paradigms. This recognition caused us to collectively dismiss old habits and any lingering denial of the need for change. The emergent paradigm shift that we discovered to be driving our challenge and the process was:

Old Paradigm: The Keeper: Leave operations to the experts. We know what's best for the customer. We own them. They have to come to us for service anyway.

New Paradigm: The Partner: Operations in Customer Service. The Customer is an "expert" also, and a partner in a service delivery. We don't own them. And, they can go elsewhere, you know!

These discussions highlighted the need to move from being the keeper of our clients, to being a partner in the academic enterprise. We could no longer appear to impose our professional standards on campus operations with the justification that we were keeping the campus safe. We had to integrate facility needs within academic priorities. This has required compromises in our operations and in our thinking.

The Incremental Design Process: The consensus building process that produced our organizational vision was an incremental building technique that became our routine method for identifying, surrounding and solving problems. Senior managers recruited individuals or volunteers for

various peer groups. The selected individuals had a functional relationship to, or passion about, the assigned topics. The peer groups cut across traditional organization boundaries. The groups were charged to define "their" problems and those obstacles which blocked the road to enhancing service to the customer. Through evaluation and brainstorming, the peer groups identified different strategies and found common ground. Bound in function toward a common goal, they came to a shared realization about the best solutions to the particular problem. They presented their recommendations to a larger peer council and to the senior managers. The senior managers established broad themes, time frames, and anticipated work products, but asked the work groups to recommend the new operating strategies. These self-directed peer groups were encouraged to be creative, to take risks, and to develop an ownership of the methods for achieving our objectives.

Work Groups: Specialty teams with limited duration and defined assignments were set up to produce a focused product. The product was something new to the organization, something that had been discovered to be a critical organizational need. The following reports were produced for internal use during the reorganization process:

The Steering Committee, *Team Physical Plant: A Proposal for Action*, October 12, 1992.

The Scheduling and Prioritization Workgroup, *Initial Design and Implementation of a Scheduling & Prioritization Function for Physical Plant*, November 25, 1992.

The Customer Service Work Group, *The Design and Implementation of a Customer Service Function for Physical Plant*, January 13, 1993.

The Mechanical Transition Team, *Mechanical Systems Management Company: Strategic Business Plan*, May 1, 1993.

The Structural Transition Team, *The Structural Co.: A Proposal For the Reorganization of Physical Plant Maintenance & Minor Construction Services at UC Davis for the 1990's and Beyond*, May 3, 1993.

The Electrical Transition Team, *Electrical Systems Management*, July 1993.

Open Forums (Town Meetings): In large, open discussion groups, staff and supervisors were encouraged to speak freely. No form of reprisal would be tolerated if an individual openly spoke his/her mind. This technique provided the opportunity for the surfacing of new leadership. This process also formed the broad basis of involvement which certified the results to be "grass roots."

Labels or Organizational Handles: "Team Physical Plant," a conscious manifestation of cultural redefinition, was seized upon to communicate that we are a team. We expect to solve problems like a team. Referring to ourselves as production "COMPANIES" recognized our evolving into enterprising, industry oriented work units.

Functional/Physical Integration: Setting up a Local Area Network for common information tied together and integrated functional islands that had flourished in the old culture. New collective tools forced a breakdown of traditional boundaries. Physically uniting shops and operations brought a critical organizational integration.

Reaching Our Customers: Outreach Teams were created for staff to "meet" our customers in their locations and take the heat of face-to-face contact. We listened intently and recorded our customers priorities.

Operational Testing: Fly before you Buy! Before we bought computer software for our new tool kit, we asked the product vendors to install their solution at our site, teach us to use it, and then test it to our satisfaction. It worked Great!

Heroic Opportunity: Volunteering our personal time to make changes was an important part of the experience. Building the computer network in the shops and the weekend work parties helped solidify the new organization.

3. An assessment of the extent to which the initiative lends itself to widespread application at other institutions.

Our strategy for managing change is very portable to organizations facing significant challenges in focus or mission, provided there is 1) a severity of need, and 2) sufficient commitment and patience from senior management. Our strategy is rooted in problem resolution from the multiple perspectives of campus customers, line staff, program managers, and includes both internal and external perspectives for the organization. Because our restructuring strategy relies primarily on multiple and conflicting perspectives, input and ideas, the program is extremely portable. Who better to assess the needs of an organization than those who "live" those problems daily?

Although most service organizations are similar in mission, products and mode of delivery vary greatly. Each organization must focus on solutions specific to its own culture. A key to the successful user-driven identification of problems and solutions is the participation of all levels of the organization. Work group leaders, line supervisors, program managers, and the process of change all must communicate the urgency for change and the value placed on the interaction of all those participating.

4. A brief description of the single most important or unique aspect of the initiative.

The most unique aspect of this initiative lies in our methodology for creating and channeling internal energy for change. The project was unusually comprehensive with no problem or issue off limits to discussion. The wide spectrum of participants brought diverse perspectives which broadened our overall view of the issues. Courage was required to knowingly walk into a "black hole" where neither the destination nor the path were clearly seen. Courage was needed to allow inexperienced staff to assume more influence over the journey and the destination.

The process of change is not unusual. The need to develop ownership or "buy-in" is not new to dynamic organizations. What was unique about our initiative was the method for assembling disparate ideas, objectives, interests, and people to achieve an organized plan. Our experience shows that when you position your organization for change, it is best to align the change process with the ongoing work process. With a change process that is work centered, you have a constant reality check on the nagging questions: "Is it going to work?", "Is it going to last?"

Creating internal energy by confining fuel, heat and air to an every tightening pressure vessel was risky and filled with headaches. An inward look of progressively more focused assessments propelled us over high mountains. Because committed, talented and strong-willed people

were involved, it worked for us. Filling the pressure vessel with talented rising stars from within our organization ensured that we would be successful.

5. A description of all details necessary to institute the idea, including a summary of improvement in effectiveness, productivity, or quality since the innovative management initiative was implemented.

The following strategies were essential for successful implementation of our initiative:

- **Facilitate widespread participation of customers, staff and managers:** The process of change must be user-driven. Without specific goals and objectives, change for change sake weakens the process. Any change must be driven by the individuals experiencing the problem.
- **Place equal value on input from all levels of the organization:** Problems identified by line staff, supervisors, craftworkers, clerical support, etc., are no less important than those identified by senior managers. Most issues of concern to line workers expose the roots of complex problems. This process also ensures that the varying issues of each level of the organization are not overlooked.
- **Apply a comprehensive, holistic approach to identifying problems and solutions:** Building a diversity of perspectives into problem evaluation/identification initiates a process of triangulation. Each different view from staff, managers and customers focuses on a specific aspect of each issue. This triangulation process ensures that the needs of each user are met.
- **Seek out and listen to criticism:** One of our most difficult hurdles was the leap of faith that our customers and internal users had valid criticism to share with us. We realized that we could not improve without listening to their views.
- **Eliminate complacency (accept that there are problems):** In the earliest discussions, this was the most difficult issue on which to form agreement. Until agreement was reached, discussions did not progress beyond a superficial analysis.
- **Utilize the abilities of line staff (both traditional and "hidden" talents exist):** For example, we recruited from all classifications in the search for the Customer Service Development Team.
- **Be open to change the direction the organization is taking (dynamic process):** The change process must be continually fine-tuned. Building the change process into the new organization ensures that staff do not become disillusioned or complacent. A strong feedback loop connecting staff, customers and managers becomes a vital tool to maintaining a dynamic organization.
- **Use the customer to assess the amount of change:** Changes must be perceivable to campus and internal customers. Continually scrutinizing new processes and evaluating their success maintains the essential feedback loops.
- **Reduce the layers of management:** Management layers weaken the triangulation process because the feedback loop becomes indirect. Policy makers are brought closer to those experiencing problems. Staff feel that they have more direct input. Staff often are our best decision makers.

•**Prepare for pitfalls:** We discovered that predictable reactions to dramatic changes can be anticipated. Change, injected into any closely-knit group, may result in pockets of denial and negativity. These reactions can be mitigated by continued team building activities, networking among organization leaders, and listening to the concerns of team members. Managers and leaders must set priorities to regularly infuse enthusiasm and honest assessment of progress into the change process. All levels of the organization must be periodically rejuvenated with positive reinforcement.

Summary of Effectiveness, Productivity or Quality

- Of the 300 staff in the work units that were reorganized, more than 120 were directly involved in workgroups.
- Craftspersons have more complete information when work is assigned which means that they are more likely to be better focused, equipped and effective in their response to a service request.
- Craftspersons who formerly had no signature authority when placing a storehouse order, now have purchase authority up to \$500. These small purchases no longer have to be signed off on by a supervisor, thus eliminating a bottle neck that needlessly ate up supervisor time, craftsperson's time, stopped the work flow, and cost the customer money without adding value to the product.
- More than 18% of the management positions which existed prior to 1989 have since been eliminated. This increased financial reserves which were diverted to other pressing areas.
- At least 40 individuals who were formerly not occupying decision making positions are now doing so.
- Instead of two separate administrative structures for the same work (one structure controlled the money and the other controlled the work), we now have one. The people who manage the work also control the budget and are responsible for the "value" received by the customers.
- A reduction in overhead costs has reduced our recharge rate for services rendered. Since our realignment of craft labor shops with operations, and our implementation of new strategic plans, our overhead recharge rate has decreased 11% (see Appendix C).

Proven Results Of This Process:

- Through on-going contact, our customers regularly validate our change to a new customer-service ethic and provide critical positive feedback to staff and managers.
- Line staff are willing to speak up and identify problems. They take more ownership in the solutions.
- We have realized widespread staff awareness of our mission to provide service to the campus—the ultimate reason for our existence. Our organizational goals are more focused and understandable to our staff and customers.

- We have achieved increased productivity as evidenced by a significant reduction in our recharge rate.

6. An outline of the extent of actual participation in the development of the idea by individuals at the institution.

The idea was developed and implemented in-house by UC Davis Physical Plant personnel. Our strategy for managing change engaged all organizational levels and each O&M work unit. This gave us a wide range of expertise and knowledge. Some of these classifications include:

Analysts	Equipment Operators	Plumbers
Business Staff	Groundskeepers	Refrigeration
Mechanics	Buyers	Laborers
Locksmiths	Sheetmetal Mechanics	Cabinet Makers
Carpenters	Machinists	Shop Supervisors
Clerks	Managers	Steamfitters
Drafting Technicians	Painters	Systems Engineers
Electricians	Planners	Superintendents

More than 120 employees, nearly 50% of the directly affected unit personnel, participated on work groups organized to address targeted strategies. Eight work groups and two management teams examined the effectiveness of organizational and program delivery strategies, suggested new operating strategies, assessed objectives and expectations for program success, and organized consensus building around work unit priorities. These work groups spent more than 9,000 hours during 1992 and 1993 in organized work sessions developing new operating strategies.

Our client outreach efforts included discussions with some 100 faculty and staff from the campus community occupying significant academic facilities. This client outreach significantly expanded communication and the education of both "O&M" staff and the campus community. Customers were encouraged to request or customize services specific to their building.

7. Names and titles of the persons responsible for the suggestion of the idea.

The more than 120 staff who participated in this management initiative are listed as significant contributors in Appendix B. Listed below are staff that went that extra mile, who "took the road less traveled by, and that has made all the difference."

Associate Vice Chancellor Darrell Ralls	Plant Operations Manager Jim Wilson
Acting Utilities Mgr. Doug Hartline	Plant Services Acting Mgr. Wayne Rebstock
Business Services Mgr. Annetta Cross	Scheduling Workgroup Chr. Van King
Campus Srvc. Comm Chr. Gina Anderson	Shop Functions Chair Bill Coulombe
Custodial Services Mgr. George Reyes	Struct. Tran. Team Chr. Hank Klenzendorf
Electrical Tran. Team Chr. Frank Lane	Struct. Tran. Team Co-chr. John Wheeler
Electrical Tran. Team Co-chr. Larry Smithy	Support Committee Chair Carrie Dye
Energy Conservation Manager Ron Forbes	Team Physical Plant Chair Ron Hamblin

Logistics Team Chair Kim Rhodes
Mechanical Tran. Team Chr. Steve Schneider
Operations Committee Co-chr. Louie Slayton
Operations Committee Co-chr. Pete Storey

Work Control Comm. Co-chr. Bob Harris
Work Control Comm. Co-chr. Leslie Nopp
Work Order Comm. Chr. Larry Parker

8. The implementation date. The idea has been implemented and results can be anticipated as a consequence of careful planning.

Implementing our idea for managing change began in 1991. Designating new strategic business units and assigning management teams was completed in late 1993. The recent implementation of organizational restructuring means that the evolution of implementation continues to shape a dynamic restructuring. This transformation is an exciting time of change. While measurable results are yet to be reported, they are clearly within the near-term. The results will be measured through reduced administrative costs, increased program productivity, and increased campus confidence in Physical Plant programs.

References

Hammer, M. & Champy, J., Reengineering the Corporation, Harper Business/Harper Collins, New York, 1993.

APPENDIX A

TABLE OF PROGRESSIVE EXAMINATIONS, PROCESSES AND THEIR FOCUS

Examination/Activity	Focus	Participants	Goal	Frequency/Duration
Problem Identification	General Issues	Line Supervisors System Managers Sr. Management	Team and consensus building. Identification of general issues. Raise general awareness internally	Weekly, 3 mos.
Team Physical Plant	General Problem Resolution	Line Supervisors Craftspeople System Managers Staff	Define affinity groups based on mode of output	Weekly/Twice weekly, 4 mos.
Team Physical Plant Workgroups	Define Specific Output Groups	Line Supervisors Craftspeople System Managers Staff	Educate internal staff about intra-unit business. Generate discussions about existing processes. Define internal consensus on priorities for change	Weekly/Twice weekly, 8 weeks
Town Meetings	Issues and Ideas of line staff and supervisors	All line staff supervisors, superintendents and managers of primary operational and service units. (In excess of 75 to 100 at any one meeting.)	Allow line staff to voice their ideas and concerns regarding the process the issues and the progress of the reorganization. Build consensus and understanding regarding the need for changes and their impact on the future of the organization.	3 hours weekly
Development Group: Scheduling & Prioritization	Identify a specific process to formalize these activities	Five staff (3 chosen by management, 2 by staff)	Develop document by which processes and protocols for prioritizing and scheduling can be managed.	Daily, 2 consecutive weeks
Development Group: Customer Service	Identify a specific process to formalize the customer service function.	Six staff from various units	Develop specific processes concepts and protocols and build a consensus for a formalized customer service activity.	8 Hrs Daily, 2 consecutive weeks
Outreach Teams	Identify customer concerns based on core facility location and department affiliation.	Nine staff supervisors from support units and various divisions.	Assess specific concerns and ideas of campus customers occupying key core area facilities.	Avg 15 hours per week over 9 mos.
Customer Service Development Team: Selection Panel	Formalize the selection process for Development Team Manager, Customer Service Representative, Scheduler and Production Asst.	Five customers, two senior managers, one superintendent and two supervisors.	Educate key customers as to our level of professionalism and dedication to the process. Choose the absolute best individuals for the positions based on their interview skills. Tap into skills of existing staff in a non-traditional way.	4 weeks, as needed
Customer Service Development Team	Reeducate staffing to formalize the Production Control and Customer Service functions recommended by Team Physical Plant.	All permanent staff were allowed to submit applications for four positions (37 applications and nominations were received in response to this process.)	Validate and acknowledge Team Physical Plant's recommendations for their most critical priorities in the reorganization process.	Daily, 1 year commitment

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Computerization of Operations Units	Upgrade the information systems of the operations units. Overhaul the 30 year old manual work order system.	Technical and non-technical volunteers, line staff, managers, supervisors, etc.	Run network cable, write a work tracking software program and train unfamiliar users in the use of 1990s computer systems.	5 FTE volunteered weekend labor to install network cable.
Examination/Activity	Focus	Participants	Goal	Frequency/Duration
Outreach Workshops	Address concerns raised by customers	All managers and supervisors	Build consensus among managers and craft supervisors to allow greater freedom to customers in performing non-skilled maintenance activities. Give those most affected direct input into developing and approving these new procedures.	4 hours, As needed
Transition Teams	Operational issues of the new organizational structure	30 key players in the new affinity groups. Groups based on mode of delivery of product.	Team building in new organizational structure. Build acceptance of new groupings; validate and identify new processes and concepts.	3 hours twice weekly, 10 weeks
Logistics Team	Logistics issues relating to the new organizational structure and the protocols developed by the Transition Teams	Logistical support staff and supervisors; transition team representatives; production unit representatives.	Team building among logistical staff education of transition teams; team building between logistical staff and transition team units. Development of protocols needed to support the transition team concepts.	Weekly, 3 mos.
Company Implementation	Set-up operating businesses	Managers, superintendents, supervisors, line staff, business support staff	Implement a quality industry based dependable service unit. Align budgetary operations and support staff around common goals. Increase productivity and reduce overhead expenses. Reduce costs to customer.	Daily, six weeks
Software Selection Panel	Identify existing work tracking, job costing, timekeeping and project management software at lowest possible cost.	20 line staff, supervisors, superintendents, managers	Review and develop a consensus as to the applicability of various software packages. Identify minimum and maximum needs of the organization. Assess the willingness to change existing systems to accommodate new software application.	Six 4-hour meetings
Software "Fly-Off"	Assess software applications in their ability to interface with our organization and direction with minimal impact selection process.	Six computer literate individuals from operating and production control units.	Develop a comfort level among operations and production control units for specific software applications by flying them in real-life situations.	Daily, two weeks
Software Implementation Group	Provide primary training to computer literate individuals within each operational unit. These individuals to spearhead training of unit staff.	Twenty computer literate individuals from operating, production control, materiel, customer service and accounting units.	Provide software specific training and problem solving support at the least possible cost. "Train the trainers."	3 hours weekly, in progress

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APPENDIX B

Major participants in the journey from, "Keeper to Partner"

NAME	TITLE	UNIT
Allred, Paul	Planner	Workload & Planning
Anderson, Gina	Administrative Assistant	Custodial
Bailey, Ray	Superintendent	Steam Plant
Barnett, John	Sr. Bldg. Worker	Electrical Shop
Baxter, Glen	Superintendent	Steam Shop
Becker, Bob	Welder	Welding Shop
Beckett, Johnnie	Administrative Assistant	Requisitions
Bekins, Reed	Drafting Technician	Engineering Services
Brinegar, Brad	Operator	Solid Waste
Bottoms, Von	Supervisor	Waste Water Treatment
Bourdon, Austin	Clerical	Shop Support
Bowers, Yvonne	Buyer	Materiel
Brown, Don	Planner	Workload & Planning
Buck, Chris	Plumber	Plumbing Shop
Callaway, Scott	Laborer	Labor Shop
Carston, Ron	Carpenter	CCarpenter Shop
Cartwright, Edie	Manager	Buildings
Castanon, Jacqui	Administrative Assistant	Personnel
Chandler, Mike	Chief	Fire Department
Christensen, Maya	Clerical	Buildings
Cooper, Hershell	Systems Planner	Buildings
Coulombe, Bill	Superintendent	Plumbing Shop
Cross, Annetta	Manager	Business Services
Duncan, Sandy	Drafting Technician	Engineering Services
Dye, Carrie	Manager	Materiel
Ebbinghausen, Dale	Plumber	Plumbing Shop
Engel, Carl	Planner	Workload & Planning
Erwin, Bill	Superintendent	Buildings
Ferrarini, Ray	Planner	Workload & Planning
Fitzgerald, Bill	Buyer	Materiel
Flag, Nancy	Principle Analyst	Facilities Administration
Fredericks, John	Refrigeration Mechanic	Refrigeration Shop
Forbes, Ron	Manager	Energy Conservation
Galduroz, Steve	Laborer	Labor Shop
Garcia, Mel	Plumber	Plumbing Shop
Gwin, Rich	Plumber	Plumbing Shop
Hall, Leroy	Supervisor	Custodial
Hamblin, Ron	Supervisor	Labor Shop
Hansen, Kurt	Superintendent	Workload & Planning
Hartline, Doug	Superintendent	Utilities
Harxis, Bob	Supervisor	Workload & Planning
Henderson, Kathy	Clerk	Energy Conservation
Hill, Ruth	Supervisor	Accounting
Hoadley, Jim	Electrician	Electrical Shop
Hollowell, Kevin	Electrician	Electrical Shop

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Holt, Tim
Holt, Judy
Holtshulte, Chris
Hood, Dale
Hood, Lois
Hugbanks, Gerald
Ingianni, John
Johnson, Brian
Johnston, Bill
Jones, Cal
Keil, Jeriy
Kelleher, Mike
Keller, Dave
Kincheloe, Bob
King, Van
Klenzendorf, Hank
Koehler, Bobbie
Lakeland, John
Lane, Frank
Lewin, John
Looney, Perry
Luna, George
Maddison, Dianne
Mains, Doug
Manas, Fred
McDole, Barbara
McDole, Ray
Milano, Bob
Miller, Ken
Mirkel, Brad
Montgomery, Brent
Neri, Steve
Nicholson, Tom
Nopp, Leslie
Ortiz, George
Osmonson, Kim
Ouzts, Robert
Parker, Charlie
Parker, Claudia
Parker, Larry
Payne, Dale
Perkins, Jetry
Peterson, Nadine
Pixton, Don
Pretty, Mick
Ralls, Darrell
Randall, Marion
Raubach, Jess
Rebstock Wayne
Redei, Les
Reveles, Edwina

Laborer
Electrician
Secretary
Supervisor
Supervisor
Electrician
Supervisor
Carpenter
Electrician
Supervisor
Supervisor
Buyer
Plumber
Supervisor
Systems Planner
Sr. Superintendent
Superintendent
Mechanist
Supervisor
Sheetmetal
Systems Planner
Assistant Supervisor
Drafting Technician
Electrician
Systems Planner
Custodian
Operator
Systems Planner
Planner
Systems Planner
Plumber
Carpenter
Planner
Supervisor
Supervisor
Administrative Assistant
Steam Fitter
Roofer
Accounting Assistant
Assistant Supervisor
Plumber
Steam Fitter
Accounting Assistant
Steam Fitter
Plumber
Associate Vice Chancellor
Supervisor
Assistant Supervisor
Acting Manager
Programmer
Clerk

Labor Shop
Electrical Shop
Contracts Administration
Machine Shop
Materiel
Electrical Shop
Electrical Shop
Carpenter Shop
Electrical Shop
Steam Shop
Filter Crew
Materiel
Plumbing Shop
Lock Shop
Buildings
Plant Service
Waste Water Treatment
Machine Shop
Electrical Shop
Sheetmetal Shop
Buildings
Electrical Shop
Engineering Services
Electrical Shop
Buildings
Custodial
Operations
Grooms
Workload & Planning
Utilities
Plumbing Shop
Carpenter Shop
Plumbing Shop
Requisitions
Grooms
Personnel
Steam Shop
Carpenter Shop
Accounting
Carpenter Shop
Plumbing Shop
Steam Shop
Accounting
Steam Shop
Plumbing Shop
Facilities Administration
Grounds
Paint Shop
Plant Service
Business Services
Materiel

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Reyes, George
 Rhodes, Kim
 Ricardo, Diane
 Ricci Carl
 Riley, Marjorie
 Ruis, Louis
 Schneider, Patty
 Schneider, Steve
 Schoffner, Max
 Scott, Neil
 Scott, Peggy
 Silva, Norm
 Skiera, Jim
 Slayton, Louie
 Smedley, Dwight
 Smith, Julie
 Smithy, Larry
 Sodersten, Charles
 Sommers, Kathleen
 Spang, Dennis
 Speckman, Laura
 Storey, Pete
 Swenson, Willard Charles
 Tallon, Wes
 Tames, Randy
 Tandy, Ed
 Taylor, Pat
 Tindel, Tom
 Vergos, Trish
 Warren, Jean
 Watson, Willie
 Wheeler, Debbie
 Wheeler, John
 Wildberger, Jon
 Wilson, Jim
 Wikel, Ernie
 Woolf, Doug
 Yates, Dennis
 Yates, Nancy
 Ybarbo, Paul
 Yoshimura, Ellen

Manager
 Supervisor
 Superintendent
 Inspector
 Secretary
 Steam Plant Operator
 Administrative Assistant
 Supervisor
 Drafting Technician
 Systems Planner
 Drafting Technician
 Electrician
 Manager
 Supervisor
 Drafting Technician
 Buyer
 Superintendent
 Electrician
 Secretary
 Supervisor
 Clerk
 Systems Planner
 Custodian
 Machinist
 Plumber
 Steamfitter
 Sheetmetal
 Planner
 Clerk
 Manager
 Superintendent
 Supervisor
 Superintendent
 Carpenter
 Manager
 Carpenter
 Carpenter
 Supervisor
 Clerk
 Electrician
 Manager

Custodial
 Buildings
 Contracts Administration
 Buildings
 Contracts Administration
 Steam Plant
 Personnel
 Engineering Services
 Engineering Services
 Buildings
 Engineering Services
 Electrical Shop
 Grounds
 Electrical Shop
 Engineering Services
 Materiel
 Utilities
 Electrical Shop
 Engineering Services
 Operations
 Electrical Shop
 Utilities
 Custodial
 Machine Shop
 Plumbing Shop
 Steam Shop
 Sheetmetal Shop
 Workload & Planning
 Requisitions
 A&E Business Office
 Refrigeration Shop
 Personnel
 Buildings
 Carpenter Shop
 Buildings/Utilities
 Carpenter Shop
 Carpenter Shop
 Grounds
 Grounds
 Electrical Shop
 Personnel

APPENDIX C

SALARY AND BURDEN RATE HISTORY
(Plant Mechanic)
Fiscal Years 88/89 through 94/95

	<u>FY 88/89</u>	<u>FY 89/90</u>	<u>FY 90/91</u>	<u>FY 91/92</u>	<u>FY 92/93</u>	<u>FY 93/94</u>	<u>FY 94/95</u>
Burden Rate	208%	205%	205%	205%	202%	202%	198%
Hourly Burdened Cost	\$40.31	\$41.33	\$43.26	\$43.26	\$42.62	\$42.62	\$41.78
Base Hourly Rate Plant Mechanic	\$19.38	\$20.16	\$21.10	\$21.10	\$21.10	\$21.10	\$21.10
Overhead Cost	\$20.93	\$21.17	\$22.16	\$22.16	\$21.52	\$21.52	\$20.68
Burden Cost in 1988 Dollars*	\$20.93	\$20.70	\$20.77	\$20.17	\$19.09	\$18.58	\$17.38 **
% Change/Year		-1%	0%	-3%	-5%	-3%	-6%
% Change/Year from 1988		-1%	-1%	-4%	-9%	-11%	-17%

*Based on published ENR factors.

**Assumes a 2.7% increase for FY 94/95

Energy and Environment

Refrigerant Management Using Ammonia

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Preface

Introduction

Currently, there are five (5) refrigeration machines on the Colorado College campus utilizing refrigerants scheduled for phase-out within the next two (2) years. These electric centrifugal units total over 1,200 tons and provide chilled water for 380,000 sf of campus buildings. Additionally, there is a 27 year old, 250 ton absorption unit serving Armstrong at 110,000 sf. The total installed value of the campus chilled water production systems would approach one million dollars.

Given the phase-out of the refrigerant used in the centrifugal machines and the age of the absorption unit, a management plan must be prepared to ensure that air conditioning is maintained in the campus facilities in the future. This plan should consider the replacement of the units as they approach the end of their useful life, the conversion of equipment to alternate refrigerants depending upon cost and availability, and the continuing maintenance and serviceability of the units and the management of their refrigerant charge.

An additional consideration for the units that are to remain is the move towards codifying ASHRAE Standard 15-1992 and ASHRAE Standard 34-1992. If adopted by the code officials, then significant modifications will need to be made to each and every machine room.

Background

The international phase-out schedule for chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) is having a dynamic impact on the HVAC industry. This phase-out is forcing many facility managers to accelerate their plans for retrofit, conversion, and replacement. This will present a significant challenge to the major chiller manufacturers, who must reckon with equipment change-out schedules of unprecedented proportions—on the order of 6,000 large-tonnage chillers per year for the next several years.

As a result of the revisions to the Montreal Protocol agreed to at a United Nation meeting in Copenhagen last November, worldwide CFC production will cease by January 1996, matching United States government policy that has been in place since February 1992. CFC demands will out-pace supply and CFC prices can be expected to climb over the next few years.

At the same time, the revised Montreal Protocol and anticipated United States Environmental Protection Agency (EPA) policy allows for the continued use of HCFCs into the next century. There are assurances from several of the major manufacturers that service/replace HCFC refrigerant will be available for the normal life-cycle of equipment installed over the next five (5) to ten (10) years. The actual formula for the availability of HCFCs is quite complex, and it is difficult if not impossible to predict the political pressures that may be applied or reversed on some of these issues.

Another class of refrigerants, hydrofluorocarbons (HFCs), is actively being developed, tested, and used because it has a zero Ozone Depletion Potential (ODP). The chemistry and politics of this issue are both complex and ever-changing. The solution to this dilemma is to implement a Refrigerant Management Plan, culminating in a facility-wide engineered solution for the CFC phase-out.

Purpose

To study the Colorado College campus chilled water/air conditioning systems and propose a refrigerant management plan to phase out the existing CFC Refrigerants which are to be banned by the Federal Government Policy.

Abstract

Plan provides for air-conditioning equipment reliability, increased energy efficiency and an orderly transition away from refrigerants no longer environmentally acceptable through a new interconnecting chilled water piping system to a new central system in the Central Plant Building.

Executive Summary

The proposed plan envisions connecting all existing buildings with a chilled water piping loop, a new, more efficient refrigeration machine at the central plant to replace the absorption chiller in Armstrong Hall and provide back-up for the other older machines, and a computerized utilities management system to replace the failed Johnson Controls System. The plan will provide for an orderly migration away from the banned refrigerants, develop system redundancy in

operating equipment to eliminate the potential of building air conditioning failure and allow for additional air conditioning loads to be added at lower costs.

Refrigerant Management Plan

Just how does one go about developing a comprehensive plan when, as at Colorado College, there are a variety of units of different manufacturer and varying in age from 1966 to 1988. The plan needs to be flexible enough so as to provide management with a decision tree that takes into account the remaining useful life of each unit, the current cost of refrigerant, the conversion cost and/or replacement cost, energy usage characteristics, and overall annual maintenance. The ideal plan will provide insight to management to judiciously operate, maintain, and replace the existing units for their remaining useful lives.

A Refrigerant Management Plan should include the following:

- A designated CFC manager.
- A clearly define containment practice.
- Written policies on containment.
- A long-term phase-out schedule for CFCs.
- A budget for refrigerant management.
- Obtain a commitment at the highest level in the organization for a long-term refrigerant management program.
- An employee awareness program.
- An employee training program.
- Appropriate operational and maintenance action to reduce refrigerant losses from each and every system.
- A plan for and training for recovery-recycle-reclaim operation.

Life Cycle Cost:

To maximize the cost effectiveness of the phase-out program, it is in the facility's best interest to evaluate the "life-cycle" cost of conversion vs. replacement vs. continuous operation for each of the five (5) units. The units in Tutt, Packard, and Worner Center could be converted from a CFC based refrigerant to an HCFC based refrigerant but the two (2) Carrier units in the Science building cannot. Current conversion cost estimates range from \$60 to \$150 per ton. For the units on campus that can be converted, this is typically in the \$25,000 range. The conversion from CFC-11 to HCFC-123 results in a 7% loss in capacity, and upwards of a 15% to 16% loss in efficiency. The replacement costs range from \$300 to \$400 per ton or \$75,000 to \$100,000 for a typical unit on campus.

Additionally, much more stringent containment policies will be needed if the decision is made to maintain the current refrigerant. The availability and the cost of the refrigerant will need to be tracked more closely. It is difficult to predict, but most estimates indicate that CFC-11 will be somewhere in excess of \$25 a pound within two (2) years and perhaps upwards of \$50 a pound within six (6) years. Some industry sources predict ultimate costs as high as \$100 per pound. At \$50 a pound the cost to replace the-refrigerant in a typical unit on campus would ex-

ceed \$30,000. This certainly points up the immediate need to make the existing machines tight and to keep them tight. Effective containment and service practices can reduce annual leakage to less than 2%. This should include the purchase of high-efficiency purged units and some type of pressurizing device for the low pressure systems: changing flare fittings to brazed, installation of back-up relief valves, and obtaining a portable or on-site storage and recovery unit.

Another aspect of the life-cycle analysis is the comparison of the energy efficiency of the existing machines to the efficiency of the new HCFC machines. New centrifugal chillers that utilize HCFC-22, HCFC-123, or HCF-134a refrigerant are being designed that can provide significant energy savings over the existing units using CFC-11 and CFC-113. The older units typically had energy ratings of 0.8 - 1.0 KW/ton whereas new units are being manufactured with energy efficiencies in the range of 0.55 - 0.65 KW/ton. Depending upon the operating profile and the cost of electrical power, new units have the potential to repay the investment in less than five (5) years. Again, the analysis must be done on a unit-by-unit basis. It should be noted that the two (2) newest machines, the Carrier units in the Barnes Science Center buildings, have exceptionally good KW/ton values (0.57). Again, these units are not able to be converted, therefore their charge of CFC-11 should be maintained for as long as possible.

Recognizing that if the existing air conditioning systems are to continue in the various buildings, then each and every chiller will have to eventually be replaced either due to age, excessive maintenance, or the refrigerant issue. When considering whether the unit should be replaced now or replaced later, the following points are worth considering:

Reasons to Replace Now:

- Few remaining years of service life.
- Low reliability.
- High maintenance cost.
- Low operating efficiency.
- High annual operating hours.
- High refrigerant leakage rate.
- High potential capacity loss with conversion.
- Low book value.
- High energy prices.
- Cost of compliance with new ASHRAE Standard 15 code requirements.

Reasons to Delay Replacement:

- Many remaining years of service.
- High reliability.
- Low maintenance cost.
- High operating efficiency.
- Low annual operating hours.
- Low refrigerant leakage rate.
- Low potential capacity loss with conversion.
- High book value.
- Low energy prices.

Refrigerant Management Plan Elements

Given the various CFC phase-out scenarios, the College needs to initiate a Refrigerant Management Plan as soon as possible. The United States Environmental Protection Agency suggests a three-step approach to start CFC phase-out. These steps include:

1. *Appoint a Refrigerant Manager.* The Manager should be responsible for all aspects of refrigerant containment and phase-out. This manager could be the assistant director of the Physical Plant or it could be chief of the HVAC shop. Given the limited number of units at the College, only one manager would be needed. The manager needs to understand budgetary and maintenance implications relevant to the decisions to be made regarding equipment conversions and replacements.
2. *Inventory CFC Equipment and Refrigerant.* This step is critical in order to know what and when equipment may need to be converted or replaced as well as how to budget for these changes. There may be sufficient opportunity for facilities within the Colorado Springs area to share CFC refrigerants through recovery, recycling, and reclamation as part of a concerted community effort. This could significantly extend the life of good equipment that would otherwise have to be replaced as CFC supplies "dry up" in the market place. The Refrigerant Manager needs to inventory and periodically update the total quantity of CFC refrigerants on site, both in storage and inside operating equipment.
3. *Develop a Refrigerant Management Plan.* The Refrigerant Manager needs to develop a management plan for the specific equipment under his area of responsibility. After completing inventory of CFC refrigerants and equipment, the manager will then assemble other information needed to choose among the available options. The three main options are:
 - **Keep existing equipment running with CFC refrigerant as long as CFCs are reasonably available.** While this approach includes some risk in considering the lead time for ordering new equipment and predicting the continuing availability and cost of CFCs, the risk can be decreased by a facility-wide CFC bank.
 - **Convert CFC equipment to alternate refrigerants.** This option is, of course, more expensive than the first (often costing between 1/3 to 2/3 as much as purchasing new equipment), but it ensures the equipment will be able to run for years to come.
 - **Replace CFC equipment with other equipment.** The new equipment can be another piece of electrically operated cooling equipment that does not use CFCs, gas-fired cooling equipment, thermal storage in conjunction with the cooling equipment, or other approaches such as decreased cooling loads with lighting retrofits or desiccant dehumidification. Also, given the projected codification of ASHRAE Standard 15, it would be incumbent to look at a central facility for all refrigerants.

Chilled Water Loop

As the need to replace each unit exists, it is appropriate to consider the alternative of a central system. The Campus currently enjoys the benefit of a central high-temperature, high-pressure, hot-water heating system serving the major facilities. Central plants, along with their associated distribution system, provide numerous advantages. One of the primary advantages to the facility manager is that operating personnel for the HVAC systems can be better utilized.

The usable space in the basement area increases when a chiller and related equipment are no longer necessary. On the average, almost 500 square feet per equipment would become available if the existing chillers and associated equipment were removed. Even at nominal storage room cost of \$50.00 per square foot, this is a sizable return. Partial load performance of Central Plants are generally more efficient than those of many isolated smaller systems, because the larger plant can operate one or more capacity modules as the combined load requires and can modulate output. Additionally, the plants provide good redundancy/backup. With the addition of a plate/frame heat exchanger, substantial energy savings can be achieved. Also, by installing all of the cooling towers in one location, the need for chemical treatment is drastically reduced, along with the hazards associated with various chemicals utilized in the academic facilities.

As mentioned earlier, when the ASHRAE Standard 15 is codified, then each of the equipment rooms will have to undergo major renovations to be in compliance. The following is a partial list of items needed for compliance in each of the existing Mechanical Rooms:

- Tight fitting doors opening outward.
- No other opening in the building that would permit passage of escaping refrigerant.
- Dimensioned for easy access to all parts and adequate space for service, maintenance, and operation.
- Clear headroom of not less than 7'-6" below equipment situated over passage ways.
- All indoor equipment rooms utilizing mechanical refrigeration must be vented to the outdoors.
- No open flames that use combustion air from the machinery room.
- Access restricted to authorized personnel.
- Machinery rooms must be equipped with an oxygen sensor, set to alarm and start mechanical ventilation at levels below 19%.
- For HCFC-123, provide a refrigerant sensor.
- No more than 300 lbs of refrigerant may be stored in a machinery room.
- At least one approved self-contained-breathing-apparatus must be provided outside the machinery room.

There are numerous other requirements for each of the equipment rooms. Anticipated costs could exceed \$18,000 per room. It is not certain when the code will be enacted, nor whether it will be regressive to existing installation.

In light of all of the oncoming regulations and the continuing debate over the various refrigerants, it is advisable to strongly consider the development of a chilled water loop and the appropriate selection and installation of central chilled water machinery.

A quick review of the existing high-temperature, high-pressure hot water heating plant reveals that there is significant area within the existing plant to install upwards of 1,500 tons of water chilling capacity. Currently, the refrigeration machines for the ice rink are also housed in this plant. Given the probability that the absorption unit in Armstrong will be the first to go, a chilled water loop could be extended from the existing Heating Water Plant east and connected to Armstrong. The Trane unit in Packard is 17 years old and probably has five (5) to six (6) years of useful life. This chilled water loop could then be extended south and connected both into Packard Hall and Worner. The Trane unit in Tutt Library is only 13 years old, and still has per-

haps 12 years of useful life remaining. The Carrier units in the science building are only five (5) years old. This chilled water loop could then be extended to include Tutt Library and the Barnes Science building and thereby allowing these remaining units to pump into the loop and provide standby capabilities for the other facilities.

MAJOR CENTRAL PLANT EQUIPMENT

WATER COOLED CHILLER R-717: (Screw Compressor)

Normal 500 Tons, Evaporation 1,300 GPM, 57 EWT 92 LWT
Condenser 1,750 GPM, 74 EWT, 82 LWT, Compressor 400 HP

COOLING TOWER:

1,800 GPM, 82 EWT, 74 LWT, 64 AWB, 25 HP

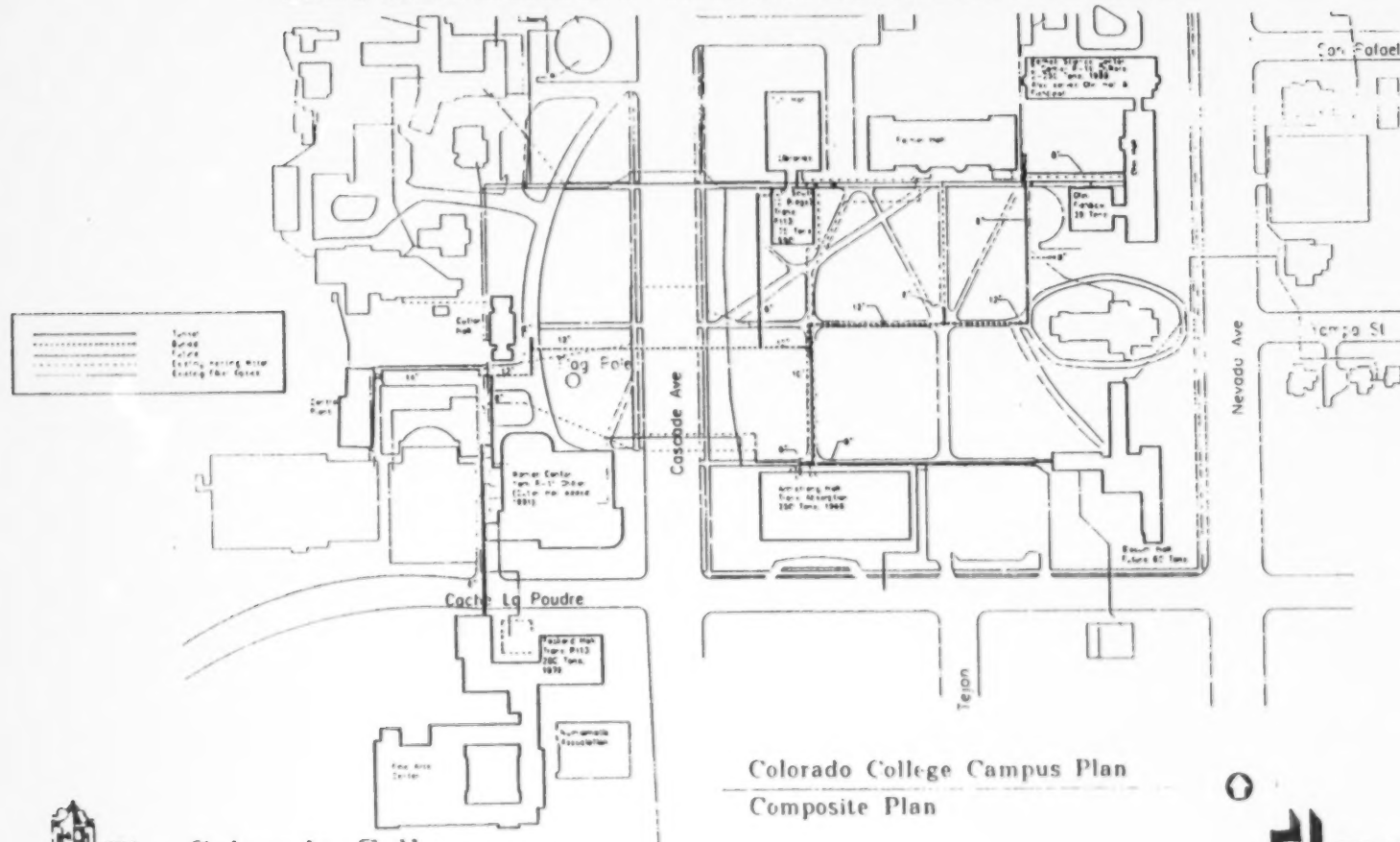
CIRCULATION PUMPS:

Chilled Water 2, each @ 1,300 GPM, 120' WCTDH, 60 HP
Condenser Water 1 @ 1,800 GPM @ 60' WCTDH, 50 HP

PLATE/FRAME HEAT EXCHANGERS:

Hot side 800 GPM, 58 EWT, 50 LWT
Cold Side 1,400 GPM, 47 EWT, 52 LWT

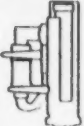
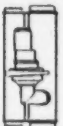
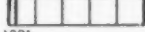
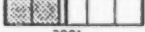
REFRIGERANT MANAGEMENT PLAN



The Colorado College



REFRIGERANT MANAGEMENT PLAN

LOCATION SIZE MAKE	ARMSTRONG HALL 250 TONS TRANE ABSORPTION	PACKARD HALL 200 TONS TRANE HERMETIC	TUTT LIBRARIES 175 TONS TRANE HERMETIC	WORNER CENTER/CULER 200 TONS YORK OPEN	BARNES SCIENCE CENTER OLIN HALL & OLIN FISH BOWL 250 TONS CARRIER	BARNES SCIENCE CENTER OLIN HALL & OLIN FISH BOWL 250 TONS CARRIER
						
YEAR INSTALLED	1966	1976	1980	1987	1988	1988
EFFICIENCY	COP = 0.80	0.83 kW/TON	0.72 kW/TON	0.68 kW/TON w/R-11 0.73 kW/TON w/R-123	0.57 kW/TON	0.57 kW/TON
ANNUAL TON-HOUR COST (\$0.05/kWh & \$3.00/MMBtu)	250,000 \$15,000	270,000 \$12,000	500,000 \$22,000	400,000 \$14,000	150,000 \$4,500	650,000 \$19,000
						
REFRIGERANT CHARGE	LITHIUM BROMIDE AQUEOUS SOLUTION	R-113 485 LBS.	R-113 415 LBS.	R-11 640 LBS.	R-11 625 LBS.	R-11 625 LBS.
TODAY \$ VALUE	\$125,000	\$60,000	\$50,000	\$60,000	\$75,000	\$75,000
CONVERSION COST	NA	20,000	18,000	30,000	NOT ALLOWED	NOT ALLOWED
REMAINING LIFE	25 YEARS 1990 2015 	25 YEARS 1990 2015 	25 YEARS 1990 2015 	22 YEARS 1990 2015 	22 YEARS 1990 2015 	22 YEARS 1990 2015 



The Colorado College

09-28-93



University Of Toronto Waste Management System

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University Of Toronto*

Introduction

The St. George campus of the University of Toronto is located in the downtown core of the city. In 1989, the University's Facilities and Services division joined the increasingly popular movement towards a heightened environmental awareness. With a campus population of 60,000 people, situated over 8.7 million square feet and 115 buildings, the waste management program is unique and complex. Through an integrated waste management approach, waste going to land-fill has been reduced by over 55%, with the goal of diverting 60% by 1996. The University has also embarked on the path to environmental regeneration with the adoption of an Environmental Protection Policy. In recognition of its achievements, in 1994 the University was selected for the Best Institution Award by the Recycling Council of Ontario.

This presentation will describe how the University has reached a 55% diversion rate and how it will achieve 60% while it examines other areas of environmental importance.

Background

The University of Toronto's recycling programs began in the mid- eighties when concerned students launched a limited fine paper recovery program, followed by an aluminium can recycling program. By 1988, a student group, the University of Toronto Environmental Coalition (UTEC), applied for and received federal funding to support and expand the paper recovery program.

The Facilities and Services Department (F&S) recognized the need to work with the students to expand recycling on campus, and in 1989 a Recycling Coordinator was hired to oversee the recycling program. F&S purchased a vehicle to collect old corrugated cardboard and in 1990 strengthened its commitment by purchasing a second vehicle for the collection of fine paper, co-mingled bottles and cans, scrap wood and metal. Collection of recyclables on campus is the responsibility of the Recycling Team of four F&S staff, who traverse the campus each day.

The collection and processing of co-mingled material was simplified when the Recycling Coordinator approached the City of Toronto and proposed a joint venture whereby the University would collect co-mingled materials, which the City would pickup and process. This agreement

provided for a weekly pickup from 10 mini depots on the St. George campus. All co-mingled materials from buildings are placed into containers either by the Caretaking staff or the Recycling Team. The City then transports and processes the recovered glass, plastic, and metal food/beverage containers, all at no cost to the University.

Although the University had initiated collection of cardboard, fine paper and co-mingled materials, F&S realized that the waste management program would achieve minimal success without the involvement of the entire campus community. The challenge was to generate enthusiasm and a sense of environmental responsibility on campus and to encourage participation in the 3R's programs- Reduce, Reuse & Recycle - a tall task for a large urban campus.

Public Participation

The Waste Reduction Advisory Group (WRAG), formed in 1990, was made up of a broad cross-section of the University population with representation from: Caretaking, Purchasing, Faculty, Students, Food Services, F&S, Administration and Senior Management. Its primary task was to develop a recycling policy and encourage the diverse environmental organizations to work together towards a common goal of waste reduction and diversion. The Waste Reduction Policy (Appendix 1) was adopted by Governing Council in 1990. The focus of the policy was the 3Rs+1 - Reduce, Reuse, Recycle and Rethink for a Healthy Environment. The Advisory Group produced a pamphlet publicizing the new policy and actions community members could carry out in its support. However, to gain broad based participation and commitment, the Group realized that ownership of the program had to be decentralized to the departments and faculties located throughout the St. George campus.

This was accomplished by the recruitment of Environmental Coordinators from each department on campus, who would serve as a liaison between F&S and their respective departments, faculties and student bodies. Their role was to work within their departments to promote recycling and encourage their colleagues' interest. The success of the program depended on the enthusiasm and interest generated by the Coordinators. By the end of 1991, over 270 Environmental Coordinators had volunteered to be part of the University's 3R's programs and the University's waste diversion efforts were steadily improving.

Quarterly meetings held with the Coordinators became the means by which F&S developed the public consultation process on a continual basis. Ideas about solid waste management could be discussed in detail, and F&S presented proposed plans for diversion strategies and the merits of these strategies. The end result was the fine tuning of ideas which were then implemented across campus. The meetings also afforded the Environmental Coordinators the opportunity to share successes and failures with their peers. Input from these Coordinators remains the crucial component of the waste management system at the University of Toronto. The information provided by the Coordinators allows for speedy, efficient development and implementation of ideas and programs.

In 1990, the Province of Ontario presented draft waste management legislation to achieve its target of 50% waste diversion by the end of the decade. The legislation was broad in scope and affected municipalities, regions, cities, institutions and the private sector. It required mandatory recycling programs for specific materials and waste audits and work plans to be prepared annually. In addition, the Municipality of Metropolitan Toronto introduced strict material bans at

its solid waste management facilities. The legislation was passed as Bill 143, the Waste Management Act under the Environmental Protection Act, and became law in 1992.

In 1992, Facilities & Services hired a Manager of Waste Management to assist in meeting and exceeding the legislated reduction target. A 60% reduction target was set. To achieve this, a move towards a three stream approach to waste management was made. This integrated waste management system handles recyclables separately from compostables and separately from residual wastes (Appendix 2).

Integrated Waste Management

The Recyclable Stream

The first step in the integrated waste management program was to re-evaluate paper recycling at the University. Although large volumes of fine paper were being collected, the University received no revenue due to the high levels of contamination by other paper grades being put in the recycling container. In fact, most of the paper reaching the recycling plant was graded as mixed. An earlier analysis found that the major component of the University's waste stream was paper and the majority of that paper could be recycled in a mixed paper program. Since the markets for mixed paper were good, the University switched from a fine paper to a mixed paper program. The mixed paper program captured more paper and made it easier for people to recycle. Since the bulk of the waste stream is paper, by capturing more grades of paper, the University was in a better position to meet its target of 60% reduction, and receive income from the recycled paper.

The next step was a review of the programs in all the buildings on the St. George campus. Since 1986, a variety of buildings had initiated their own independent recycling programs. The goal of the review was to assess program needs and to recruit participation to the University wide program. The Waste Management Office embarked on a one year project of blending the existing recycling programs with the F&S program, to ensure consistency across campus and eliminate confusion. With the assistance of a grant from the Ministry of The Environment, over 10,000 recycling containers were provided in all 115 buildings. The project was completed in October 1993.

Building occupants place paper for recycling into a blue deskside container. When full the desksider is emptied by the occupant into a 64 gallon Schaeffer toter. The Caretaking staff place the full toter outside for a scheduled pickup. Cardboard is placed in a designated area by the occupant, the Caretaking staff then bring the cardboard to a central pickup area where it is collected by the Recycling Team and taken directly to the mill. Recycling containers for co-mingled bottles and cans are located throughout all buildings. Caretaking staff then empty these containers into City containers or place them in a central area for pickup by the Recycling Team. Clearly the Caretaking staff play a crucial role in any recycling programs.

As 60% of the University waste stream is paper, the University purchased a special vehicle to collect and transport paper to appropriate markets. The paper collection truck has 3 compartments to collect 3 streams of recyclables, mixed paper, co-mingled materials and newsprint. In any week, the truck services over 100 locations and delivers over six tons of paper to the paper mill.

To recycle scrap wood, metal, tires, and surplus equipment, the departments call F&S for a special pickup. Scrap metal is sent to a local scrap dealer and wood to a company which remanufactures clean wood into other products. Wood which is pressure treated, or otherwise contaminated, is used for landfill cover or is incinerated at a waste to energy facility. Laser toner cartridges are recycled by the departments by contacting the cartridge manufacturer, and batteries are recycled in designated depots. Packaging polystyrene is put out for pickup with the corrugated cardboard and is taken to the recycling facility bi-weekly. Post-consumer polystyrene is collected from all major food outlets on campus. This material is bagged and set out for collection with the cardboard. Before shipping white goods (refrigerators and freezers) with the scrap metal, the freon is recovered.

Today the University provides collection from 115 buildings for the following materials: mixed paper, corrugated cardboard, co-mingled bottles, cans and plastic, scrap wood and metal, polystyrene, laser toner cartridges, household batteries, scrap tires, white goods, surplus equipment and food wastes. Most materials for recycling are picked up by the Recycling Team on a daily basis.

Compostable Stream

The next consideration was the compostable stream, consisting mainly of food and yard wastes. A detailed study was funded through the Ministry of the Environment to find the best method to compost or divert organics generated on campus. The study looked at a variety of methods from backyard units to rotating bins and in-vessel midscale units. The University even examined the possibility of setting up a windrow facility off campus! Each composting method available was scored according to risk and chance of success. Being a downtown campus eliminated the widespread use of backyard units. The costs of running a windrow facility eliminated that option and in-vessel units were costly and depended upon unproven technology. The most reasonable method was to find a suitable off-campus operation which could take food wastes.

A compost farm, licensed to take food and yard waste, was found outside the Greater Toronto Area, and an arrangement made with a contractor to transport food waste from the University. The contractor provides clean containers for the food waste and monitors the quality of the waste. A pilot project at a major food outlet on campus was declared a success when 3/5ths of the waste stream was diverted to composting.

It should be noted that the success of any food waste compost project depends on the staff who work in the kitchens. Great care must be taken to ensure contamination is kept to a minimum especially if plate scrapings are to be included.

Of the four major food outlets on the St. George campus, three are composting 50,000 gallons of food waste/year with the fourth scheduled to commence in September 1995.

Yard wastes are collected on a much larger scale. In the fall, the Grounds Department places leaves and brush collected in 40 cubic yard rolloffs, which are taken to the Municipal yard waste compost site. Christmas trees are shipped with clean wood, while grass clippings are left to compost on the lawns. Wood from trees and shrubs on the campus grounds are also chipped and used as mulch in gardens.

Residual Stream

The residual stream is what remains after recycling and composting efforts. This stream is the most difficult to control. It can be diverted through reduction and education campaigns.

A unique component of the residual stream is surplus equipment. In the past, this equipment sometimes found a home within the University, but all too often ended up at landfill. The Swap Shop was created as a campus location for the exchange of surplus equipment and other materials. Members of the campus community are encouraged to bring equipment deemed obsolete by the Purchasing Department. In turn, students, faculty and staff are invited to take any equipment they require for work or study purposes. Some equipment has been donated to charitable organizations. To date hundreds of pieces ranging from computers to lab benches have found new homes all over campus.

Promotion And Education

With an ever changing population of students and visitors to the campus, the University developed a comprehensive education program and produced several unique pilot projects to help increase environmental awareness. Some specific elements of the education and promotion are given below.

Frosh Kits

Approximately 5,000 new students, called "Frosh", arrive on campus each September, who have no idea what 3R's programs are available to them. As part of their Frosh kit, new students are provided with information regarding the University's waste management programs. They receive a reusable cloth bag, with the University's recycling logo and crest: "*it's not waste 'til you waste it...*", and information on recycling is available in student planners and activity books. The Waste Management Office also participates in Frosh week activities to further promote waste reduction initiatives.

Academic programs at the University of Toronto are usually four years in length. The idea behind informing Frosh about recycling programs is to capture attention and commitment from the first days on campus. After four years, the entire student body should be more aware and willing to participate in the recycling programs. New students arriving on campus will see senior students participating and as a result will also be encouraged.

Waste Reduction Handbook and Flyer

Pamphlets designed as a handout to all students, faculty and staff are a simple way of communicating the University's Waste reduction policy, stressing "How You Can Help", and the 3R's programs.

Newsletter - "4R Environment"

The 4R's are: Reduce, Reuse, Recycle and Rethink. This quarterly newsletter, published by the Waste Management Office, provides information to over 1,500 members of the University

community on waste management and other environmental issues. A wide variety of topics ranging from biodiversity to energy management have been covered.

Reduction of Publications Sent to The University

Suppliers also play a part in the University's waste reduction efforts. The Environmental Coordinators wrote to suppliers providing updated mailing lists, asking that distribution be revised accordingly. As a result, incoming chemical supplies catalogues have been reduced by one third. The demand for new telephone directories was also reduced by promoting the use of centralized Yellow Pages and reordering of White Pages to every two years.

The Waste Reduction Advisory Group met with the many newspaper publishers on campus to discuss possible reduction in the numbers of newspapers published on campus. After many meetings and discussions, the circulation of the two largest newspapers were reduced in number and one newspaper reduced the size of its pages! Many other newspapers agreed to use recycled content in their newsprint.

Advertising

Several times a year, an advertisement is placed in the student newspapers informing staff and students about recycling at the University. A page in size, this is designed to be cut out and used as an information poster. Smaller advertisements are used throughout the year to keep the campus community informed and interested.

The Recycling logo and slogan are placed on the sides of all recycling trucks and act as travelling bulletin boards. The signs are removable and the messages can be changed at any time.

All recycling containers at U of T have "U of T Recycles" either in the form of a sticker or stamp.

Special Projects

Salt Study

A salt study examined salt usage on the grounds at the University. The study highlighted the damage to the grassy areas and sandstone buildings, and included a cost benefit analysis on the use of salt versus a salt substitute, Calcium Magnesium Acetate. The investigator, a fourth year Environmental Sciences Student, found that salt was seriously damaging the grounds and parts of the buildings' fabric. The report recommended a salt alternative be tested around buildings where damage was being caused and the results of a pilot project is now being evaluated.

Minimum Waste Project

A minimum waste project is being piloted at the University's 215 Huron Street building. This 10 storey administrative building is home for more than 500 employees. The project is designed to severely eliminate waste by providing recycling for most materials and eliminating the use of many disposable materials. The first step was the replacement of all employees garbage

cans with a blue box and an attached mini garbage can. The mini garbage can was used in anticipation of there being very little non-recyclable waste generated. All kitchen wastes were composted while glass bottles, metal cans, polystyrene, mixed paper and plastic pop bottles were recycled. Other waste generating products would be replaced with a reusable product. Paper towels are an example of an item totally removed from the building; these were replaced with linen towels or hand driers. Staff were kept well informed and involved prior to the program launch and encouraged to participate. Environmental Coordinators from each floor worked diligently to ensure there were no surprises and that the project ran smoothly. The switching of the waste containers was done in one day. This coincided with a kickoff event that made people aware of the goal of the project and provided a sense of responsibility and ownership. A waste audit has confirmed that the results to date are an 86% diversion rate. Due to its success, similar blue boxes and mini-garbage cans have been installed in over 50% of the University's buildings and a project is underway to remove paper towels from other buildings on campus.

Cost/Benefits

In addition to the contribution made to the protection of the environment, the waste reduction program has been financially viable for the University. Initial start-up capital was provided by the government and the University. The annual waste collection costs have been held flat for the last four years. The savings from the reduction in garbage collection contracts and the revenue from the recycled products have offset the operating costs - the coordinator, manager and recycling staff, promotion and education, and ongoing supplies. Key to this breakeven position is a careful monitoring of both the volumes being hauled by the garbage contractors and the volumes of recycled materials. In 1994, prices for the recycled materials have escalated, producing favourable variances.

Conclusion

The integrated waste management system has resulted in a 55% diversion of waste from landfill. This program has significant commitment from all levels of the University of Toronto; students, faculty, staff and visitors.

What makes the accomplishment noteworthy is the sheer size of the Institution within which the many complex program elements were implemented over a relatively short period of time. Sixty thousand people, situated over 8.7 million square feet and 115 building campus area who are using over 10,000 recycling containers and 10 depots, have all contributed to the success of the program.

Given these results, the University was encouraged to review other environmental practices. As part of this review, the Waste Reduction Policy was revoked and an expanded Environmental Protection Policy adopted by the Governing Council in 1994 (Appendix 3). Three fundamental principles are explicitly recognized as part of the Policy, (i) to minimize the negative impacts on the environment, (ii) to conserve natural resources, and (iii) to respect biodiversity.

To implement the policy, an Environmental Protection Advisory Committee (EPAC) was established with broad representation, similar to the Waste Reduction Advisory Group. EPAC's designated role is to advise the Assistant Vice President, Operations and Services, on programs

to meet the environmental protection objectives set out in the Policy. EPAC is in the process of preparing its first report.

The challenges to be faced should continue to be as stimulating and rewarding as those over the last four years.

RETHINK HOW TO REDUCE, REUSE AND RECYCLE

FOOD & BEVERAGE

- Use your own mug.
- Supply mugs/cups for guests; do not stock styrofoam cups.
- Bring set of dishes and utensils to leave in desk at work.
- Use your own refillable container for drinks.
- Stock office with sugar, cream and milk in bulk.
- Use environmentally safe dishwashing soap for office dishes.
- Bring cans to recycling bins at Robarts, MSB, or New College or take bottles and cans home for Blue Box.
- When buying drinks in containers, buy them in bottles or cans.
- Buy only what you are going to eat.
- Empty cans/bottles before recycling.
- Do not accept an additional bag when purchasing food.
- Use reusable dishes and utensils if restaurant or cafeteria offers a choice.
- Request china service rather than paper service when ordering for catered events.
- The Garbageless Lunch!
 - Pack your lunch in a reusable carrying case
 - Pack your food in reusable containers
 - Pack reusable cutlery
 - Use cloth napkins
 - Use recyclable or reusable drink containers.

OFFICE PRODUCTS

- Recycle your laser jet cartridge.
- Follow University procedures for furniture disposal.

REMEMBER!

RECYCLE COSTS \$\$\$

REUSE COSTS \$\$

REDUCE COSTS 0

For further information and specific details, please contact your
Departmental Environmental Coordinator:

Name: _____

Telephone: _____

This brochure was produced by the University of Toronto Campus Waste Reduction Review Group in October 1990. The University Community will be kept informed of new programs as they evolve. For information, contact the Recycling Coordinator at 978-7080.



UNIVERSITY OF TORONTO

WASTE REDUCTION

HOW YOU CAN HELP

REDUCE, REUSE, RECYCLE
AND RETHINK
FOR A HEALTHY ENVIRONMENT



WASTE REDUCTION POLICY UNIVERSITY OF TORONTO

THE NEED

Canadians generate more waste per capita than the citizens of any other nation, with Ontario (specifically Toronto) as the worst offender. Costs in terms of wasted resources, and the impact on the environment of waste disposal are enormous. The need for determined efforts to accomplish substantial waste reduction objectives must be strongly supported by the University of Toronto community. In anticipating and meeting the increasingly severe restrictions on waste disposal, the University of Toronto must strive to instill personal and collective responsibility for its waste.

FUNDAMENTAL PRINCIPLES

1. Faculty, staff and students have the responsibility to participate actively in the following practices regarding waste reduction on campus.
 - a. **REDUCTION:** Reduction at source is of primary importance in avoiding the generation of waste altogether.
 - b. **REUSE:** The use of an item again in its original form for the same, or for a different purpose.
 - c. **RECYCLING:** The separation of material at source to facilitate its return to reusable material.

These three are known as the waste management hierarchy. Reduction is better than reuse, and reuse is better than recycling. Examples of how the above can be accomplished are through steps such as two-sided photocopying, the use of interdepartmental envelopes, routing slips, cutting down the use of styrofoam containers, reduction of excess packaging, the separation of bond paper for recycling, and the use of recycled products.
2. Purchasing policies and practices will be regularly reviewed to ensure that they reinforce these waste reduction principles.
3. As an integral part of the waste reduction program, the University of Toronto will provide education to the University community on the importance of waste reduction and the implementation of effective practices. Every participant must have specific information on how to treat components of the waste stream.

4. The community as a whole and the members as individuals must commit to the programs for complete effectiveness.
5. The University will comply with Federal, Provincial and Municipal by-laws on waste disposal incorporating these requirements into new construction and renovation programs.

GENERAL GUIDELINES

1. The University of Toronto will take primary responsibility for the implementation and maintenance of the waste reduction programs using the best available information and techniques.
2. The University of Toronto will establish and maintain a "Waste Reduction Advisory Group" which will include representatives of faculty, staff and students, to facilitate the planning and monitor the operation of waste reduction programs. Membership of the group will be made known to the Campus to ensure that new and existing initiatives are brought forward for consideration.
3. The Recycling Coordinator of the University of Toronto will, with the assistance of the Waste Reduction Advisory Group and Physical Plant, facilitate the development, implementation and evaluation of waste reduction programs.
4. The University of Toronto will initiate pilot projects to gain experience about different types of waste and reduction methods.
5. The University of Toronto will require all businesses and organizations on campus to abide by this Waste Reduction Policy by:
 - (a) including the requirements of the policy in all contracts or general conditions;
 - (b) informing all organizations who use the facilities of the University that they must comply with the requirements of the policy.
6. The Waste Reduction Policy will be reviewed after a period of two years, or sooner if required, to assess effectiveness.

RETHINK HOW TO REDUCE, REUSE AND RECYCLE

PAPER

REDUCE

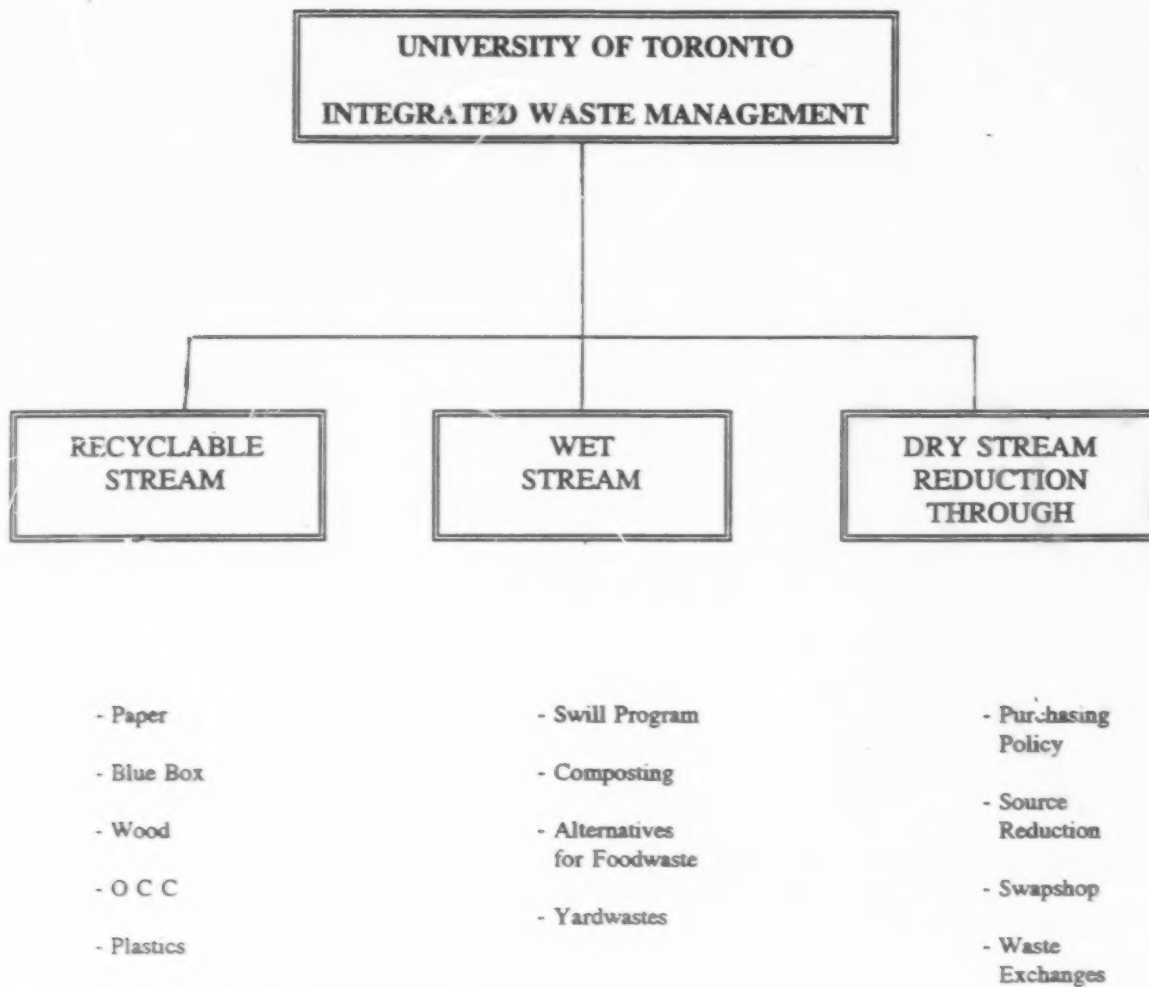
- Use double-sided copying.
- Check distribution and mailing lists periodically to eliminate unnecessary names.
- Use inter-campus envelopes.
- Keep memos and letters to one page.
- Store information on computer disks rather than paper.
- Use electronic mail instead of paper memos.
- Get yourself off mailing lists.
- Use both sides of every piece of paper.
- Keep telephone books in a central location.
- Use routing slips to circulate memos.
- Do not use self-adhesive labels or coloured paper.
- Use the library for magazines.
- Wrap presents in patterned cloth.

REUSE

- Reuse regular envelopes.
- Save one-sided paper - make into scratch pads.
- Use recycled paper.
- Bind documents with staples, not glue.
- Use recyclable labels.
- Buy second hand books.

RECYCLE

- Store fine paper for recycling.
- Ask your Departmental Coordinator what kinds of paper can be used and where recycling bin is.
- Keep paper flat to conserve space in recycle receptacles.
- Use a shredder to recycle confidential documents.



University of Toronto OFFICE OF THE VICE-PRESIDENT - BUSINESS AFFAIRS AND CHIEF ADMINISTRATIVE OFFICER

UNIVERSITY ENVIRONMENTAL PROTECTION POLICY

PREAMBLE

The University of Toronto is committed to being a positive and creative force in the protection and enhancement of the local and global environment, through its teaching, research and administrative operations. Recognizing that some of its activities, because of their scale and scope, have significant effects on the environment, the University as an institution, and all members of the University community, have a responsibility to society to act in ways consistent with the following principles and objectives:

FUNDAMENTAL PRINCIPLES

- Minimization of negative impacts on the environment
- Conservation and wise use of natural resources
- Respect for biodiversity

SPECIFIC OBJECTIVES

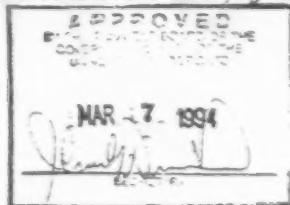
In adopting these fundamental principles, the University will be guided by ethical attitudes towards natural spaces and will take all reasonable steps to meet the following objectives:

- Minimize energy use, through efficient management and practice
- Minimize water use, through efficient management and practice
- Minimize waste generation through reduction, reuse and recycling
- Minimize polluting effluent and emissions into air, land and water
- Minimize noise and odour pollution
- Minimize and where possible eliminate use of chemicals, including outdoor salt, pesticides, herbicides and cleaning agents
- Include biodiversity and environmental concerns in planning and landscape decisions
- Meet and where possible exceed environmental standards, regulations and guidelines

IMPLEMENTATION

To implement this Environmental Protection Policy:

- An Environmental Protection Advisory Committee (EPAC), will be established consisting of representatives of the administrative staff, academic staff, and student groups, to be chaired by a member of the University's academic staff. The Committee will provide advice to the Assistant Vice-President, Operations & Services, on programs to meet the environmental protection objectives. Membership of the Committee will be made known to the community to ensure that new and existing initiatives are brought forward for consideration. The meetings of the EPAC will be open.
- Facilities & Services, through the Waste Management Department will facilitate the development, implementation and evaluation of environmental protection programs, and will liaise with the EPAC and all three campuses on the programs.
- In this role, Facilities & Services will:
 - Regularly review University policies and procedures to ensure consistency with this policy;
 - Carry out appropriate environmental audits and pilot projects;
 - Undertake education and training programmes to inform the University community about this policy and how its members, both personally and collectively, can best meet the objectives set forth in it;
 - Inform all contractors, service operations and users of University facilities that they must comply with requirements of the policy.
 - Annually issue a Report concerning the University's impact on the environment, summarizing initiatives undertaken and identifying matters which require particular attention.



March 7, 1994

Janice Oliver
Janice Oliver,
Assistant Vice-President,
Operations & Services

The Social Engineering Of Energy Conservation

Paul D. Ruskin

*Communications Coordinator
Office of Physical Plant
The Pennsylvania State University
University Park, Pennsylvania*

Colonial Energy Management

I. Introduction to Ben Franklin

Welcome to Philadelphia. This morning we are going to do a little time traveling to visit one of the first APPA members. After all, this meeting room is surrounded by history. Valley Forge is just a few miles that way and Independence Hall is several blocks over there. If we were to be suddenly thrust back 500 years to the year 1495, there would be no city at all, just deciduous forest. We might find a few Native American villages along the Delaware River where the fishing is especially good. Energy management for these natives consisted mainly of keeping the campfires burning. They never worried about it because they knew the forest would always be there!

By 1706, the forests in Philadelphia were mostly gone. The trees became buildings, furniture, ships, and, of course, heat. Ben Franklin was born in that year and about 250,000 English colonists lived on the east coast. The population of Philadelphia was under 10,000; the streets were unpaved and poorly lit, and the houses were heated with smoky fireplaces and homes often burnt to the ground. Mr. Franklin would work to change all that.

Heating and Ventilation

Ben Franklin was in many ways the first American Physical Plant Administrator. Look at his accomplishments. In 1739 he invented the Franklin stove to better heat rooms and save fuel. It featured a flue which doubled back on itself to form a radiator which helped move the heat into the room. He also invented the metal chimney damper for controlling ventilation and smoke.

Interior and Exterior Lighting

Mr. Franklin developed an improved whale oil candle which lasted longer and gave a cleaner and whiter light. He also adapted this "whale oil technology" to street lighting with a four-sided lamp which stayed clean longer and transmitted more light.

Electric Utilities

Most people know about Ben Franklin's famous kite flying experiments, but few know that he invented much of the technical vocabulary still in use today. Here are just a few of his words: battery, charge, discharge, armature, condenser, conductor, electric shock, and positive and negative electricity.

In 1751 he published an 86 page booklet entitled, "Experiments and Observations on Electricity Made at Philadelphia in America by Mr. Benjamin Franklin." His kite experiments confirmed that electricity and lightning are the same thing, and in 1753 he erected the first lightning rods here in Philadelphia. Always the public citizen, Franklin was quick to provide lightning protection for the new Academy and State House.

Ben Franklin as the APPA Prototype

If Ben Franklin were alive today, would he be an APPA member? Well, consider this: In 1724 he traveled to London and sold purses made of that new American all purpose, wonder material - asbestos! By taking it out of the country, he was one of the first people to be involved in asbestos removal.

Energy History before 1974

For 500 years American Institutions prospered by conquering nature. Our scientists tamed lightning and lit our buildings. Cheap, abundant energy empowered the nation and the frontier spread west following the energy sources.

Penn State Energy - before 1974

In 1855 the Pennsylvania State College received its charter. Early students completed their lessons by the fireplace or the oil lamp. Historical records record the following:

- 1859 - Fuel costs for the entire college were \$708.62.
- 1862 - Students paid a \$5 annual fee to cover lighting incidentals and lard oil lamps.
- 1872 - An annual coal fee of \$5 was added to their bills and students were required to keep kindling and coal dust cleaned up and to take ashes to the pile behind Old Main.
- 1875 - All students paid a \$20 fee to contribute to fuel, lights, and public spaces.
- 1887 - President Atherton installed the first 50 horsepower generator to provide electric lights on campus.
- 1910 - 24-Hour electric service began for the first time at Penn State.

- 1914 - Penn State switched from direct current to alternating current.

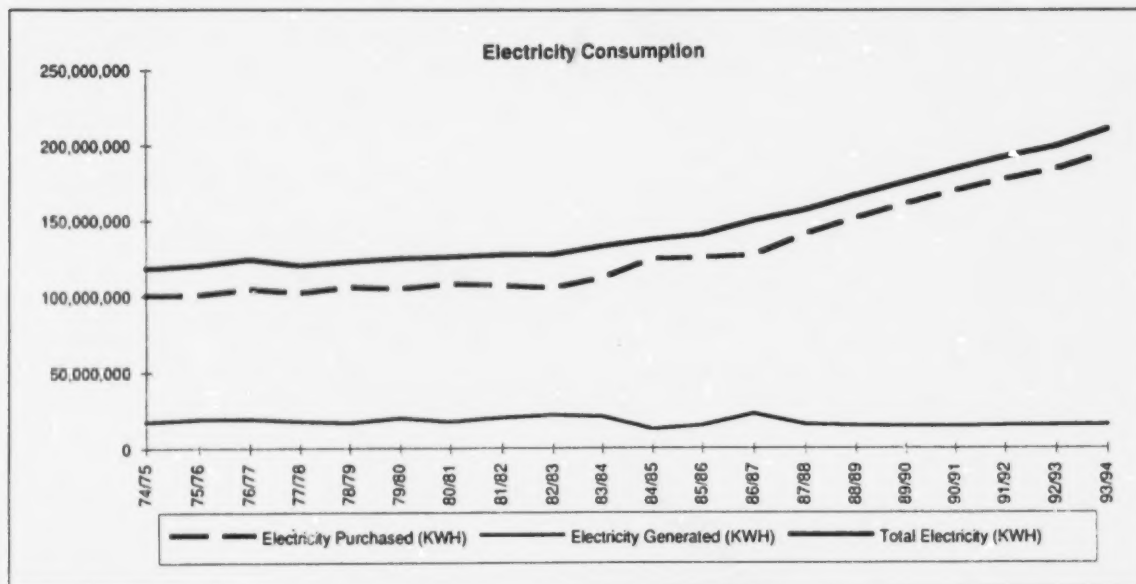
Energy History after 1974

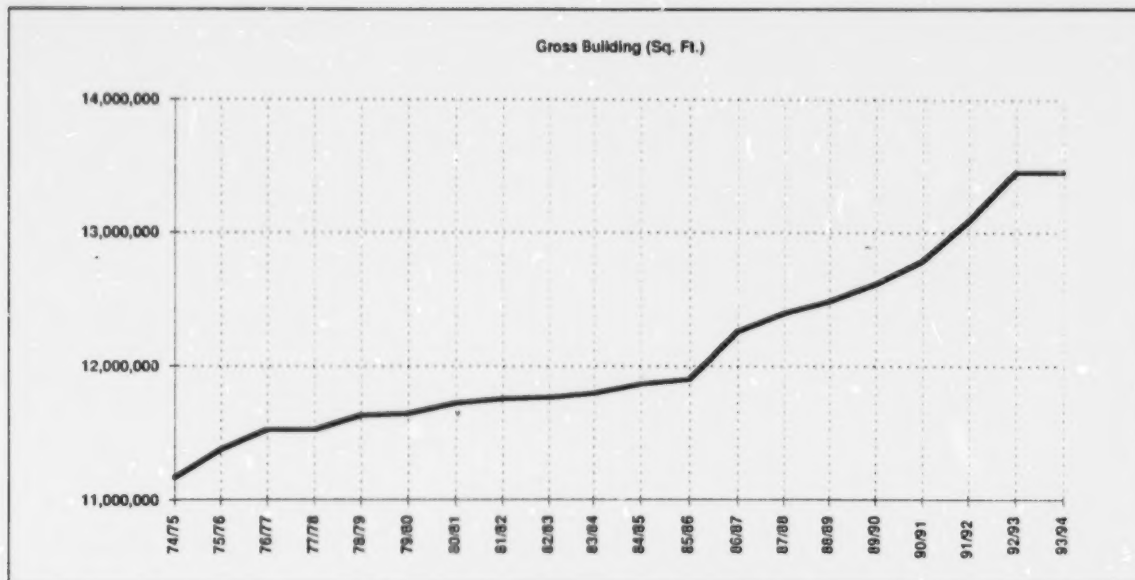
The oil shock of 1974 brought a dramatic end to complacent consumption. Penn State reacted by appointing an "Energy Czar" and initiating various conservation programs. All over campus unneeded lights began to go out; in many places every other light was green tagged, even street lighting was reduced to 50%. The following emergency measures were established in 1974:

- An "Energy Czar" and a university-wide committee were appointed.
- 200 Building energy audits were conducted and about 10 priority projects completed
- Payback time was used to determine feasibility.
- Windows were sealed with plastic.
- Indoor winter temperatures were reduced to 65 degrees for two years.
- A centralized Computer Control System (CCS), that was already in planning stage, was activated to regulate building energy consumption by remote sensors.

Efforts continued for about a decade and then faded out shortly after the "Energy Czar" retired in 1989. Many of those initiatives, such as CCS are still reaping benefits today. Penn State had 11,165,000 gross sq. ft. of building space in 1974 and today has 13,450,000 sq. ft..

In 1974 we used 118 million Kwh of electricity per year and now we use 210 million Kwh per year. The increased usage is mainly due to more air conditioning and electronic office, research, and student related equipment. For example, the typical residence hall room in 1974 had very little electronic equipment. Today's dorm rooms all have cable TV service which means that nearly all students bring an old television to college. They usually bring the oldest set their parents have which translates into the least energy efficient. Many also bring stereos, computers





and printers. The University supplies every residence hall room with a combined microwave/mini-refrigerator unit. These 6,000 units cost us about \$20 each a year in electricity (at 4.3 cents/Kwh), and that adds \$120,000 a year to our electric bill.

The Penn State Energy Island

The Pennsylvania State University is an energy island located midway between Philadelphia and Pittsburgh. Here are some basic facts about the utility operations:

- The campus includes 642 buildings totaling 13.45 million gross sq. ft.
- Heat is supplied by the east and west campus steam plants and distributed through 17 miles of pipes.
- Coal is the primary fuel, but oil and gas are also used depending on need and pricing.
- Electricity is purchased from the local utility for 4.3 cents/Kwh.
- We cogenerate between 5-10% of our own electricity.
- Our energy costs for the University Park Campus are between \$10-12 million a year.

The Campus Energy Committee

Origins of Committee

The Campus Energy Committee (C.E.C.) was formed in December of 1992 as an effort to offset budget reductions proposed by Senior University Administration. It was established as an Office of Physical Plant standing committee by the Assistant Vice President for Physical Plant, Norm Bedell.

Composition of Committee

The members were appointed from the Office of Physical Plant and recruited from the larger energy consuming Colleges such as Agriculture, Science, and Engineering, and various student groups such as Eco-Action and the Undergraduate Student Government. The OPP Communications Coordinator was also appointed to handle the public awareness aspects of the program. The Director of Utilities, Douglas Donovan, and the Director of Maintenance and Operations, George Schimmel were appointed as co-chairs.

Mission of Committee

- Examine energy consumption in principle buildings.
- Develop an action plan to reduce campus energy consumption.
- Identify those with highest energy consumption.
- Determine ways to reduce operating cost.
- Make the campus community aware of energy conservation.
- Publicize conservation program successes.
- Campus OPP Committees will serve as local liaison.
- Expand the scope of the winter break heat reduction program.

Social Engineering and Public Awareness

The lessons of the seventies show that our employees and students resisted any attempt to dictate conservation measures which reduced personal comfort. During the winter holiday we reduce building temperatures when nearly everyone is on vacation and we still meet resistance. The Energy Committee established a series of public awareness campaigns aimed at involving the campus community and persuading them to adopt a lifestyle of energy efficiency. Here are some of the approaches we use:

Campus Energy Contest

- Used as a device to gather ideas from the general campus community
- Three general categories:
 - 1) What can individuals do to save energy?
 - 2) What can the University do to save energy?
 - 3) What can the residence halls do to save energy?
- Three \$100 prizes were donated to the winners with the best ideas.
- We had 126 entries and learned that a common concern was overheated buildings.

Residence Hall Competition

- Awards given for the dormitory which had the lowest monthly utility bills.

- This idea was one of the winners from the Campus Energy Contest noted above.
- Free laundry tickets and forty pizzas were given out as prizes.
- Actual costs for electricity and water were publicized in the cafeterias and commons.
- Energy costs of typical appliances such as TVs, irons, computers, etc., were publicized.
- Typical residence hall cost/month/student for electricity and water was \$7.
- Results were minimal, most students showed little interest.

Campus Energy Quiz

- Video bulletin board question and answer pages on cable television
- This is a one-page question followed by a one-page answer which teaches a small energy awareness lesson. The approach often focuses on home related savings.
- Energy habits are more easily changed at home because the economic stake is higher. The new habits then are conveyed to the workplace and Penn State ends up with an employee who turns off unneeded lights.
- Questions are run about 200 times a day for 5 days, or about 1,000 exposures a week.
- High visibility to channel surfers and very positive audience responses
- Sample Energy Quiz Questions follow:

Q.Does the University have to pay real energy bills?

A.Yes, in excess of \$10 million a year, the electric bill alone is \$800,000 a month.

Q.Should computers be left on 24 hours a day?

A.No, computer life is directly related to the number of hours it's used. You should always turn off your computer at the end of the workday, especially on Fridays!

QHow much money was saved by last year's winter holiday energy set back?

A.The University saved a total of \$213,432 in utility costs, about \$20,000 a day!

Q.How much does it cost the average viewer to run a color TV for a month?

A.Electricity cost is \$3.75/month, the cost to the human brain remains undefined.

Student Energy Patrols

- Engaged Eco-Action student group to patrol classrooms at night and turn off lights.
- Patrols also asked students to share rooms to avoid lighting a classroom for one student.
- Successful, but time consuming, motion detectors will be in place next year.

"ENERGY" Electronic Bulletin Board

- The ENERGY bulletin board runs on the Penn State administrative E-mail system.
- Postings feature OPP energy projects and popular science type topics in energy technology.

- They are copied on the Penn State General News Group postings for easy student access. All the articles are short one page items with a reference to a longer source.
- There are over 50 items on the list at present.

Vehicle Slogans

- Office of Physical Plant vans and staff shuttles used as mobile advertising space.
- Stick-on signs were originally used, but switched to interchangeable ones for variety.
- Campaign expanded to Commuter Express buses which carry 77,000 riders a year.
- Slogan samples follow:

P.....PLEASE
S SAVE
U UTILITIES

MOTHER WANTS YOU TO SAVE ELECTRICITY*

**(mother Earth)*

CONSERVE HOT WATER - IT'S A COOL IDEA

LONG SHOWERS ARE MONEY DOWN THE DRAIN

BRIGHT STUDENTS DIM THE LIGHTS

SLIM DOWN - WALK UP

TRY THE STAIRS - NO WAITING

NO WASTING

NO WAISTING

BURN FAT, NOT OIL

TRY WALKING

IT'S MORE FUN IN THE DARK, TURN OUT THE LIGHTS

Some ideas were rejected by the committee as being too negative:

Energy conservers grope around in the light hunting for the dark switch.

The light at the end of the tunnel has been extinguished as a conservation measure.

Campus Publications

- *News & Views* articles—Office of Physical Plant in-house paper reaches 1,500 employees, retirees, and all Penn State Campuses.
- *Intercom* articles(23,000 readers)—This is the Penn State in-house employee newspaper published weekly. We have developed a continuing series of articles highlighting our campus energy conservation efforts. It is called "Conservation Corner."
- *Collegian* articles (19,000 readers)—The student newspaper is widely read by university employees, community members, and, of course, students. We submit letters to the

Op/Ed section as a means of correcting mis-information. We also use it to explain emergencies.

Target Audience Campaigns

- Facility Coordinator briefings are one-on-one meetings with the key personnel in each college who operate buildings.
- Group meetings with trades people and janitorial workers to convey conservation ideas
- Briefings to key administrators to create support for projects.
- Energy notebook is a key tool to persuade power brokers to support the program.

The Penn State Energy Bill Of Rights

- This document was developed to assure the university community that the energy conservation program is a defender of their interests. Conservation efforts are sometimes viewed as administrative mandates which threaten individual rights, especially after the 1974 crisis when winter temperatures were set to 65 degrees.
- The goal is to confirm the positive relationship between employer and employee and explain the balance between rights and responsibilities regarding energy usage.
- The Bill of Rights is a work in progress. Our latest version follows.

Penn State Energy Bill Of Rights

Campus Energy Committee

April 1995

The Penn State Campus Energy Committee proposes that the following energy rights are an inherent understanding between the University and it's employees and students. These rights are hereby defined in order to protect our basic working conditions, such as the appropriate need for heating, ventilation, light, safety, and access to the workplace. The institution is committed to provide basic environmental conditions which foster educational and research productivity, and individuals are expected to help our University reduce energy losses by understanding their energy rights and responsibilities. Our current energy resources are finite, and conservation is our best method of cost containment.

Article I - The Rights & Responsibilities Of Comfort

The Pennsylvania State University shall provide a reasonable level of winter heating which allows employees and students to function in a normal, productive manner. Reasonable is defined as 75 degrees Fahrenheit with a plus or minus comfort range of 3 degrees. The right to heating also involves the individual's responsibility for monitoring and reducing excessive heating whenever possible. All instances of unnecessary/excessive heating should be reported to the College Facility Coordinator or the Service Desk.

The University recognizes that air conditioning is generally desirable and has a long-term commitment to provide for it with new construction. There is also a commitment to effi-

cient building-wide systems which provide cooling with the lowest energy consumption. Existing spaces may be cooled with window units under conditions spelled out by pre-existing policy. Although the University supplies air conditioning to some areas, it is not a basic right. Cooling is only provided in office and classroom areas to enhance productivity. It is not provided in undergraduate living areas since summer housing usage is limited. Special arrangements can be made for legitimate medical reasons.

The University shall provide sufficient ventilation to interior spaces on campus. Occupants have a right to expect an appropriate air changing capacity for their personal space. The University will meet industry standards whenever possible.

Article II- The Rights & Responsibilities Of Illumination

The University shall provide sufficient illumination to enable employees and students to read, write, and achieve all functions requiring eye/hand coordination. Accepted industrial lighting level standards will be followed whenever possible.

Everyone has the right to be safe in the workplace, and all lighting changes and reductions must not hinder campus safety efforts. Exterior nighttime lighting on walkways will meet minimum foot-candle standards. Upgrading will occur in accord with safety priorities.

The employee/student is responsible for the efficient management of the lighting resource in their immediate area, even with automated systems (see Article V).

Article III - The Rights & Responsibilities Of Building Access

The University is committed to providing sufficient access to its facilities to allow continuing support for research and teaching activities. Energy conservation measures which shut down buildings and restrict operating hours must be arranged with the building occupants. Their needs must be provided for at different locations or times. Research and teaching will receive higher priority than conservation measures, but employees and students need to be responsible and flexible when reasonable options are offered. Options may include space reassignments, schedule changes, and restricted hours of building operation.

Article IV - The Rights & Responsibilities Of Energy Self-Determination

The University must provide for manual override of environmental control systems when-ever possible. Individual controls are usually not feasible, but the University will strive to install shared thermostats which control no more than three rooms. Automatic systems which manage energy use should respond to local control if the user stays within the approved comfort zones or has special exemptions. Employees and students have a right to localized control within approved limits as long as they act responsibly.

Current and Completed Projects

- The winter holiday break enables us to reduce temperatures in most University buildings to 55 degrees for a period of about 10 days. Each year we save between \$131,000 and \$243,000 in energy costs.

- Kern Building Lobby lighting retrofit with T-8 lamps and electronic ballasts is saving \$2,800 a year.
- West Campus Steam Plant lighting project is saving \$15,000 a year .
- Borland Laboratory lighting retrofit is saving 120,000 Kwh a year.
- Nearly all of the 2,800 exit signs on campus have been replaced with L.E.D. kits, saving about 400,000 Kwh and \$70,000 a year. Payback is less than one year.
- The Willard Building lighting project to be completed this summer is expected to save \$10,000 a year.
- Additional energy saving projects are planned for large lighting areas such as Rec. Hall, South Gym, and the White Building.

Funding

- A specific Energy Conservation Fund number has been established; it will start by drawing leftover money from the previous year's fuel budget.
- Additional funding will be accrued from savings generated by energy conservation measures as they are completed.
- Outside funding is available from the Pennsylvania Energy Office in the form of 50% financing of competitive Technical Assistance (TA) studies and Energy Conservation Measure (ECM) grants. The University has used this source to conduct numerous studies and implementations at various campus locations. Grants are limited to \$75,000 per campus.

Conclusions

- Even though our utility costs are still rising, our consumption levels have recently started to fall. We have repeated our conservation messages in many public media outlets, and we know the public is absorbing them, but we simply don't know if the campaign is responsible for the drop in consumption. There are many environmental, operational, and social factors which influence consumption levels, and they are inherently difficult to influence.
- The energy conservation program has operated with minimal resources. We have allocated 1/4 of a full-time-employee to manage the program with the help of several members of the Utilities Division as support. All the non-OPP Campus Energy Committee members and students are involved on a voluntary basis. The formal energy budget has only recently been established.
- Contest awards and prizes were donated by the University Bookstore, Housing and Food Services, the local power company, and retail outlets. This has all helped to keep our operating costs low.
- New technologies and operating procedures which directly influence customer and employee comfort must be carefully explained before they are introduced to encourage acceptance.

- The Bill of Energy Rights has more application as a discussion catalyst than as a document of policy.
- Penn State has conducted this program with limited resources, and most of our experiences should apply to smaller institutions. We certainly don't have all the answers, but wanted to share what we have learned as we experiment with new approaches.

The Future Of Energy Conservation

- Societies become extinct for many reasons including inefficiency. The Sumerians, Mayans, Celts, Etruscans, and many other once vigorous cultures are no longer here because they failed to manage their resources efficiently. Likewise, our educational institutions must do more with less. We have the opportunity to increase our operational efficiency through new energy technologies, but we must have the support of administration, employees, and students. The social engineering of energy conservation plays a key role in the acceptance of new technology and new behaviors.
- Penn State spends over \$10 million a year on energy bills. How many books could \$10 million buy if it were not spent on coal and electricity? Renewable energy sources might someday eliminate our fuel costs altogether, but not until they become much more reliable. No, we will never have totally free power, but we can reduce the cost if everyone agrees to conserve. We have taken the first steps towards the social engineering of this agreement.
- As Ben Franklin wrote in *Poor Richard's Almanac*, "It's a long heavy cable out there. I wish I could see the end of it. Why, I don't believe it has any end: somebody has cut it off!"

The Greening of Facilities

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Green design of the '90s is a horse of a different color than the energy-saving '70s when we all dimmed the lights. It requires an integrated process for developing healthy, high performance building while minimizing their impact on the environment. With a new cohesive approach to using mainstream materials and technologies, green design saves energy, enhances indoor air quality and meets EPA regulations while making your facilities politically correct.

What is Green Design?

Unlike the environmental movement of the 70s, which resulted in very specific solutions such as the earth home and the use of sophisticated, new technologies for solar collectors, etc., the facilities resulting from this integrated approach look like normal buildings. They meet functional needs and blend into the campus. While they employ mainstream materials and technology, they result in a high performance building. And they respond to goals to not only create a healthy, pleasant environment for current users but also to sustain our resources for future generations.

Why Green Design?

There are many reasons for targeting "green" criteria for your design and construction projects. Energy conservation with its associated cost savings is the one that first springs to mind and has been targeted already on many campuses. IAQ (indoor air quality) has in recent years become a buzz word, following the outbreak of legionnaires' disease. Productivity can be substantially increased with a healthy environment, which supports the current trend to tighten the ship and do the same job with fewer people. Also we have seen increasing regulatory requirements in recent years. There is talk that fiberglass will be the asbestos of the 90s. Addressing all of these issues is a benefit to adapting a policy to support "green" design.

The Christner Partnership, Inc., architects/planners/interior designers, and William Tao & Associates, Inc. mechanical/ electrical/plumbing/fire protection engineers, with Croxton Collaborative as environmental consultant, have recently worked with two clients who have embraced the notion of "green" design in two very different applications. These two projects, presented as case studies in the APPA lecture, illustrate the variety of projects to which these "green" criteria can effectively be applied. The Research Center for Biodiversity at the Missouri Botanical Garden, St. Louis, Missouri makes use of an inner city industrial site with a new structure specifi-

cally designed for their research and collections storage. At Principia College in Elsah, Illinois an existing historic building is being renovated with a large addition designed to serve as the undergraduate Science Facility. This building is located in the heart of a village-style campus designated as a National Landmark based on architectural merit. The solutions to these two design challenges manifest themselves visually in very different ways but many of the green elements are strikingly similar. Five sustainable design factors described below were integrated into these projects to insure a "green" design solution.

Site Environmental Factor

The most obvious site issue is one of siting and building orientation. With a new building, like the Missouri Botanical Garden Research Center, it is possible to orient the building to allow maximum daylight into the occupied areas with a south-facing exposure while protecting the collections storage from ultra-violet deterioration and thermal changes on a windowless north side. At Principia, the new addition to the Science Facility is snuggled into the hill on the north side of the existing building to minimize its visual impact. Both projects reuse existing developed sites and the existing infrastructure. Other site environmental strategies decrease demands on storm water systems by increasing permeable surfaces, using gray water (from roof drains and/or internal sinks and showers) for site irrigation and reforestation of the site.

Energy Conservation Factor

Some estimate that buildings consume as much as 40% of the energy used in the United States. One of the major goals in designing a "green" building is to significantly reduce its total energy consumption. Each building contains an enormous amount of embodied energy resulting from the energy consumed to mine/harvest the raw materials, to fabricate the construction materials, to ship to the site and to construct the building. During its lifetime energy is consumed to operate and maintain the building. After the life span of the building or any of its parts, the demolition and ultimate disposal of the materials consumes energy or contributes to land fills. All this energy contributes in varying amounts to acid rain, global warming and ozone depletion. Materials specified for a project can be assessed for their effects on the environment.

Many "green" strategies have already been employed for decades but most applications are isolated attempts dealing with a single building component. In order to optimize the energy saving strategies for the Research Center and the Science Facility, a detailed computer simulation based on the DOE2 (Department of Energy) model was done for each project. This showed how the individual energy conservation measures (EMCs) will affect the energy consumption (and emissions), how they interact and the best combination of EMCs. The proposed EMCs for the Science Center adds 6% to the cost of construction (short term) but results in a 40% reduction of operating energy costs and a 38% reduction in harmful emissions over a code-compliant building (long term).

Because the Research Building is a new structure, the shape of the building can be compact, reducing the amount of exterior exposure. With the Science Facility the small, linear crescent-shaped form of the existing building dictated an extended footprint with many setbacks to break up the scale of the new addition. Compact massing was not an appropriate option.

Particular care was taken in both projects to construct a tight exterior envelope. Additional insulation and air infiltration barriers were specified. Windows are triple-glazed with low-E glass. Windows are operable to provide ventilation during swing times of the year, reducing the period required to air condition the buildings. To ensure a good, tight envelope, air infiltration testing will be done both during construction and at completion. This will be a simple visual test using colored gas under pressure. It will establish the level of care required during construction and remedy any detailing which might overlook air infiltration issues. By ensuring the tightness of the exterior envelop, the design safety factor in sizing the mechanical systems can be greatly reduced, subsequently reducing the electric service required to serve a smaller unit.

Lighting can use up to half the total building operating energy. Many times lights are turned on when the working level is adequate because the space is perceived as dark. By increasing the indirect light and providing light, reflective surfaces, the room appears to be bathed in light. Enclosed fixtures mounted in ceilings produce more heat and consequently reduce the amount of light from the same tube by 20%. Suspended direct/indirect fixtures are proposed for the major building spaces. Fixtures will have energy-efficient lamps and electronic ballasts to reduce energy and will be controlled by occupancy and daylight sensors.

One of the surprises on the energy simulations of the Science Center is the reduction of energy possible from increasing the amount of window area even though most of the windows in the addition are north facing or shaded by adjacent woods. Transoms and dormer windows raise the heights of the windows to allow natural light to penetrate further into occupied spaces. With the south-facing windows at the Research Center, light shelves at transom height reflect direct sunlight to the ceiling, where it in turn reflects to interior areas. Perforated shades or blinds can be used on the lower windows to reduce glare while filtering the natural light.

Mechanical systems were selected for energy efficiency and low emissions. Because electricity in Illinois is generated from high-sulfur coal, a gas engine chiller was selected for the Science Building for air conditioning. It will be located in a new central plant facility to eliminate the noise and vibration from the engine in the teaching facility and to contribute to redundancy and efficiency of the central chilled/hot water loop serving the major academic buildings on campus. Direct digital controls (DDC), variable speed pumps and fans and cold deck temperature re-sets also contribute to overall energy savings.

Healthy Environment Factor

Another aspect of "green" design is creating a healthy environment, which reduces illness and contributes to the productivity of the building users. Some materials give off toxic fumes only during fabrication or construction. Others emit toxic fumes throughout their life span and contribute to toxic wastes. Materials for both these projects, including lumber products, insulation, paints, binders, sealants, additives, joint compounds, cleaners, seam tapes, and stain inhibitors, were examined for toxicity over their entire life span. Materials containing urethane, vinyl and solvents were avoided wherever practical. This is the first building I've seen in twenty-five years of practice which does not use vinyl tile or vinyl base, due to its harmful emissions during manufacture. Fabrics, including carpeting, will be solution-dyed or natural. One of the striking things about inspecting a "green" building is the lack of "new" smell due to the reduction of products that give off toxic gases. Reduction or sealing of porous materials, including acoustic ceiling tiles, reduces the absorption of toxic fumes and vapors, particularly in laboratories.

Another important element of creating a healthy environment is the introduction of a high level of fresh air. Even though this does increase the amount of energy needed to heat and cool the building, it is important to the occupants of the building. By introducing it through the mechanical systems instead of through infiltration of the exterior skin, it can be more carefully controlled and introduced where it does the most good, at work stations. High particulate filtration and careful location of intake louvers minimize pollutants entering the building.

Recycling Factor

Recycling of previously developed sites and buildings reuses existing infrastructure and saves the energy embodied in the existing materials. Reuse of building materials from other structures will also achieve energy conservation. Many materials, including gypsum wall board, subfloors, countertops and tile, can be made from recycled materials.

The design of a building can support recycling programs for the users. Chutes and collection areas can make it easy for the users not only to recycle materials waste but also separate it at the source, making pick-up and handling much more efficient.

Global Factor

One of the benefits of reducing the amount of energy consumed by a building is an accompanying reduction in contribution to acid rain, global warming and ozone depletion. As a result of the 40% energy reduction projected for the Science Center, a 38% reduction is projected for emission of sulfuric oxide, nitrous oxide, carbon dioxide, particulate matter and volatile organic compounds. By the wise selection of building components and systems, the development can help to reduce resource depletion and, ultimately, toxic wastes and landfills.

Sustainable Operations and Maintenance

Once the building is constructed, the notion of a "green" building isn't finished. The same care in selecting the building components and systems should be used in selecting cleaning and maintenance products. It does little good to create a healthy environment and continuously use toxic cleaning products which off-gas in the building. Many colleges and universities have implemented programs to reduce wastes by reducing sources, recycling, carefully managing hazardous materials and implementing responsive purchasing and operating policies and procedures.

No longer does energy efficient mean wearing sweaters in the winter. We can have it all: a building which satisfies our functional needs, blends into our campus character, creates a healthy, productive environment and is environmentally responsible. By engaging in this integrated process, demanding high performance from our building and carefully considering components and systems, we can save our institutions operating costs and contribute to the quality of life of future generations. Everyone comes out a winner.

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